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CARCINOGENESIS ABSTRACTS

National Cancer Institute

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service National Institutes of Health

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July, 1974

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CARCINOGENESIS ABSTRACTS

A monthly publication of the

National Cancer Institute

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PREFACE

Carcinogenesis Abstracts is a publication of the National Cancer Institute. The journal serves as a vehicle through which current documentation of carcinogenesis research highlights are compiled, condensed, and disseminated on a regular basis. It represents an integral part of the Institute's program of fostering and supporting coordinated research into cancer etiology. Issues of *Carcinogenesis Abstracts* normally contain three-hundred abstracts and three-hundred citations (unaccompanied by corresponding abstracts). Abstracts and citations refer to the current scientific literature that describes the most significant carcinogenesis research carried on at the National Cancer Institute, other governmental agencies, and private institutions. *Carcinogenesis Abstracts* is intended to be a highly useful current awareness tool for scientists engaged in carcinogenesis research or related areas. The great number and diversity of publications relevant to carcinogenesis make imperative the availability of this service to investigators whose work requires that they keep abreast with current developments in the field.

Carcinogenesis Abstracts is normally published monthly. Volume XII covers the scientific literature published from Jan 1974 through Dec 1974. To increase the usefulness of *Carcinogenesis Abstracts*, Volume XII, a Wiswesser Line Notation index and a Chemical Abstracts Service Registry Number index have been provided. These indexes reference compounds described in abstracted articles. A cumulative subject, author, CAS Registry Number, and Wiswesser Line Notation index for Volume XII will be published shortly after the final regular issue.

Carcinogenesis Abstracts is available free of charge to libraries and to individuals who have a professional interest in carcinogenesis. Requests for *Carcinogenesis Abstracts* from qualified individuals should include statements of their relationship to carcinogenesis research. All correspondence should be addressed as follows.

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The Secretary of Health, Education and Welfare has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through November 30, 1977.

NOTE

Journal names are abbreviated according to the list of abbreviations used by *Index Medicus*. For ournals not covered by *Index Medicus*, the abbreviations (with some modifications) found in *World Medical eriodicals*, 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jap.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
In.	Indonesian	Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone	mg	milligram(s)
ADP	adenosine diphosphate	min	minute(s)
AMP	adenosine monophosphate	ml	milliliter(s)
ATP	adenosine triphosphate	mm	millimeter(s)
C	degrees centigrade	MTD	maximum tolerated dose
cm	centimeter(s)	ng	nanogram (10^{-9})
CNS	central nervous system	pg	picogram (10^{-12})
cpm	counts per minute	p.o.	orally
DNA	deoxyribonucleic acid	ppm	parts per million
e.g.	for example	r	Roentgen
g	gram(s)	RBC	red blood cells (erythrocytes), red blood count
μg	microgram(s)	resp.	respectively
hr	hour(s)	RNA	ribonucleic acid
i.m.	intramuscular	s.c.	subcutaneous
i.p.	intraperitoneal	sec	second(s)
IU	international unit(s)	U	unit(s)
i.v.	intravenous	UV	ultraviolet
kg	kilogram(s)	WBC	white blood cells (leukocytes), white blood count
LD$_{50}$	median lethal dose(s)	wk	week(s)
m	meter(s)	wt	weight(s)
M	molar	yr	year(s)
mEq	milliequivalent(s)		
mM	millimolar		
μM	micromolar		
mC,μC	milli-,microcurie(s)		

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01 LEUKEMIA AND LYMPHOMA IN EXPERIMENTAL AND DOMESTIC ANIMALS. *(E.)* Kaplan, H. S. tanford Univ. Sch. Med., Calif.). *Ser Haematol* 2):94-163, 1974.

e literature on the genesis of leukemias and lymph- as in mammalian species is reviewed under the fol- wing headings: morphology, histogenesis, and clin- al manifestations; strain and species differences susceptibility; constitutional factors in suscep- bility; etiologic agents (ionizing radiation, RNA d DNA leukemia-lymphoma viruses); target cells for oplastic transformation; role of the thymus; im- nology of experimental leukemia; immunocompetence, munosuppression, immunostimulation, and immune sur- illance; altered properties of neoplastic cells; d genetic control of susceptibility. (581 refer- ces)

02 A TIER SYSTEM APPROACH TO MUTAGEN TESTING. *(E.)* Flamm, W. G. (Food Drug Adm., Wash- gton, D.C.). *Mutat Res* 26(4):329-333, 1974.

e need for a reliable system to identify chemical tagens is discussed, the criteria to be satisfied such a system are enumerated, and a tier system proach to mutagen testing is proposed. The time en regulatory agencies must decide what actions ed to be taken as safeguards against chemical mut- gens is approaching. These decisions will depend eatly upon whether laboratory tests are available which to formulate regulations. Such laboratory sts must meet the following minimum criteria to ceive consideration for implementation within a gulatory context: 1) reproducibility; 2) evidence at the test is capable of measuring an effect which either closely or directly related to genetic fects of concern to man; and 3) evidence that the st is practical. The approach suggested to meet ese criteria involves the employment of a hierarch- cal system of tests and is referred to as a tier ystem. The first tier or level of testing is a rescreen to set priorities for more in-depth testing. his tier would use microbial organisms coupled to ammalian metabolic activation systems with the in- ent to measure comprehensively: 1) all genetic events f concern to man and 2) the consequences of mammal- an metabolism acting upon non-mutagens to yield utagenic metabolites. Substances found to be mut- genic in the first tier would be presumed to be utagens and would be subjected to further testing n tier two to determine whether they are indeed utagenic to mammalian cells and higher organisms. ubstances positive in both tier one and two would e assumed to be mutagens in the qualitative sense. scertainment of the risk portended by exposure to hese "qualitative mutagens" would be needed in many ases, either because of attendant benefits or the ifficulties involved in eliminating the substance. 'ier three would assess risk under defined use con- itions. This activity is assumed to require in- act mammals in which induced gene and chromosome utations are ascertainable in the range of their pontaneous mutation rates. It is likely, however, o be two or three yr before such gene mutational ssays are perfected for mammals. For the interim, ests such as the specific locus test must suffice despite the need for tens of thousands of progeny and the entailing logistical problems. (20 references)

3603 ENVIRONMENTAL DETERMINANTS OF HUMAN CANCER. *(E.)* Epstein, S. S. (Case Western Reserve U. Sch. Med., Cleveland, O.). *Cancer Res* 34(10):2425-2435, 1974.

The scope of the human cancer problem with specific emphasis on chemical and environmental carcinogens is reviewed. The best documented data on carcinogenesis due to chemicals are those on tobacco. There are also many studies that demonstrate the contributory role of urban air pollution, and the effects of carcinogenic drugs and occupational exposure to carcinogens. Problems in the recognition of chemical carcinogens are caused by the relative insensitivity of current toxicological techniques which are limited in their ability to detect carcinogens individually and in various combinations or mixtures which realistically reflect low or ambient levels and patterns of environmental exposure. However, attempts have been made on both quantitative and qualitative extrapolation from toxicological data. The need for epidemiological surveys will not be obviated by well-planned and well-executed animal testing, but will continue to be needed to provide *post hoc* information on geographical or temporal clusters of unusual types or frequencies of carcinogenic effects after exposure to undetected or untested chemical agents in the environment. Evaluation of the benefits and risks of using carcinogenic chemicals in consumer products involves serious philosophical and sociological questions which must be settled on the basis of economically unconstrained and expert advice. (85 references)

3604 *IN VITRO* MALIGNANT TRANSFORMATION OF CELLS BY CHEMICAL CARCINOGENS. *(E.)* Mishra, N. K. (Univ. Illinois Med. Cent., Chicago) and G. di Mayorca. *Bichim Biophys Acta* 355(3/4):205-219, 1974.

Chemical carcinogenesis *in vitro* is reviewed with regard to the current data, an experimental model for screening and an hypothesis on the molecular mechanism. The following categories of the most commonly tested chemical carcinogens are briefly discussed: 1) polycyclic aromatic hydrocarbons; 2) aromatic amines, amides and azo dyes; 3) alkylating and arylating agents; 4) nitroquinoline-N-oxide and related compounds; 5) urethane and hydroxyurethane (mentioned only); 6) naturally occurring compounds; and 7) promoters. The screening model is discussed from each of the three basic approaches to studying *in vitro* carcinogenesis: 1) mass culture methods; 2) clonal treatment methods; and 3) viral-chemical cocarcinogenic systems. It appears that most chemical carcinogens are metabolized to ultimate carcinogens which are strong electrophiles and are highly reactive with nucleophilic molecules of the tissues such as the bases of nucleic acids. This observation may provide the logical basis for explaining the mechanism of carcinogenesis for a widely diverse group of chemicals through a single unifying hypothesis. The hypothesis is that chemical carcinogens act by inducing a single point mutation or a frameshift mutation in the cell genome. The results of experiments designed to test this hypothesis appear to support its premises but additional investigations are still in progress. (70 references)

3605 IS ABERRANT NUCLEIC ACID METHYLATION RELATED TO MALIGNANT TRANSFORMATION? *(E.)* Gantt, R. R. (Natl. Cancer Inst., Bethesda, Md.). *J Natl Cancer Inst* 53(5):1505-1508, 1974.

Evidence relating aberrant methylation of RNA to malignant transformation is summarized and evaluated. The complexities of the nucleic acid methylating enzymes and the problems associated with obtaining adequate experimental controls for malignant transformation are emphasized. The results of early studies led to the conclusion that there are qualitative rather than quantitative differences between the RNA methyltransferases in tumor cells and those in corresponding normal tissue extracts. Most of the early experiments, however, could be criticized for lack of proper controls. The use of a paired cell-line system obviates these criticisms, and when the methylase capacities in cell-free extracts from a paired cell-line system (one of which produced tumors while the other did not) were compared, the malignant cell extracts had a greater capacity than the nonmalignant cell extracts. This corroborates the hypothesis of aberrant nucleic acid methylation as a primary event in some kinds of cancer. The facts implicating aberrant methylation as a fundamental event leading to malignant transformation consist entirely of circumstantial and indirect evidence of a correlative nature. This statement, however, is essentially true for every other proposed fundamental mechanism of transformation. Evidence supporting the plausibility of the aberrant methylation hypothesis comes from the area of chemical carcinogenesis. All the oncogenic agents examined to date alter methylation of nucleic acids but there is currently no way of knowing whether these methylations are primary and causal, secondary, or concomitant to neoplastic transformation. It is concluded that the importance of the question, the large body of circumstantial evidence accumulated, and the availability of a system that might answer the question clearly justify intensive research. (27 references)

3606 FACTS AND THEORIES ON VIRUSES CAUSING CANCER AND LEUKEMIA. *(E.)* Gross, L. (VA Hosp., Bronx, N.Y.). *Proc Natl Acad Sci USA* 71(5): 2013-2017, 1974.

It is possible to explain the development of cancer in several members of the same family tree, in the same and different generations, by assuming that tumors and leukemia are caused by oncogenic viruses transmitted in a latent form from one generation to the next. The term "vertical transmission" was coined to describe this form of transmission among pathogenic agents. In most instances, the oncogenic viruses are invisible and harmless to their carrier hosts. Occasionally, however, under the influence of endogenous or exogenous inducing factors, these viruses become activated and cause the development of cancer or leukemia. According to this concept, the law of obligate communicability established for all common infectious agents applies also to oncogenic viruses: each tumor or leukemia can be traced to another similar tumor which developed in a member of the family from a preceding generation as a result of "vertical" passage of the same oncogenic virus. This concept holds that at one time, perhaps centuries ago, these viruses entered from outside the animal hosts, and that they have since been transmitted from one generation to the next. The theory of vertical transmission of latent oncogenic viruses is consistent with experimental and clinical observations made during the past two decades. This concept provides a logical and promising approach to the problem of the viral etiology of neoplastic diseases. (26 references)

3607 ARE VIRUSES CONCERNED IN THE ETIOLOGY OF HUMAN LEUKEMIA? *(E.)* Gallo, R. C. (Natl. Cancer Inst., Bethesda, Md.) and R. E. Gallagher. *Ser Haematol* 7(2):224-273, 1974.

Type-C RNA tumor viruses, etiologically related to the development of leukemia/lymphoma in several animal species (probably including subhuman primates) are reviewed. The genetic information for these viruses is derived from genes of the homologous animal host, but additional or altered genetic information is present in the genome of type-C RNA tumor viruses. In both lymphatic and myelogenous leukemia in man, components have been found which are biochemically analogous to reverse transcriptase and to high-molecular wt, genomic RNA in mammalian type-C RNA tumor viruses. In human acute myelogenous leukemia (AML), the type-C viral-related reverse transcriptase and high-molecular wt RNA have been specifically related to these components in tumor-associated type-C viruses from subhuman primates. AML cells contain additional ribonucleotide sequences not present in normal leukocytes; they are related to sarcoma-specific nucleotide sequences in certain mammalian sarcoma viruses. The data suggest that type-C viral-related information in AML cells arises either from extensive genetic alteration of endogenous virogenes in a given individual or from horizontal transmission of infectious viral information between homologous or heterologous hosts. It is proposed that the expression of these altered (leukemogenic) virogenes produces a coordinate disturbance in the molecular control mechanisms regulating granulocyte differentiation, which eventually results in AML. Analyses of other types of human leukemia, both with antisera to reverse transcriptase from mammalian type-C viruses and with nucleic acid probes from these viruses, indicate that the pattern of relatedness is different from that noted for AML. Continued investigations along these lines should help elucidate the nature of type-C related components in all types of human leukemia and the mode of transmission of such information. (151 references)

608 AN INTRODUCTION TO STUDIES ON THE ETIOLOGY OF HODGKIN'S DISEASE. *(E.)* Levine, P.
(Natl. Cancer Inst., Bethesda, Md.). *Cancer Res*
4(5):1146-1148, 1974.

r many years, clinical and epidemiological obser-
ations have suggested that Hodgkin's disease was
aused by an infectious agent. Current information
s linked the Epstein-Barr virus and possibly RNA
iruses to human lymphoma, and improved laboratory
echniques are now being applied in attempts to un-
erstand the exact role of these agents, if any, in
he disease process. This paper concentrates on the
resent status of some of the newer epidemiological
pproaches to the etiology of Hodgkin's disease, such
s case control studies and cluster analysis. In addi-
ion, the apparent effect of genetic factors, naturally
nd iatrogenically determined immunological abnormal-
ties, and other factors are briefly considered. (37
eferences)

609 EPSTEIN-BARR VIRUS SPECIFIC DIAGNOSTIC TESTS IN INFECTIOUS MONONUCLEOSIS. *(E.)*
lenle, W. (Univ. Pennsylvania Sch. Med., Philadelphia),
. E. Henle and C. A. Horwitz. *Hum Pathol* 5(5):551-
65, 1974.

roperties and detection of the Epstein-Barr virus,
he differentiation of various virus related anti-
gens, the titration of the corresponding antibodies
in human sera, and the relation of Epstein-Barr virus
to infectious mononucleosis are reviewed. The causa-
tive role of the Epstein-Barr virus in infectious
nononucleosis is established by a series of facts.
The disease occurs only in individuals who have no
antibodies to the virus; the presence of such antibodies is a dependable indicator of immunity to the disease. Rising titers of antibodies to Epstein-Barr virus related antigens can be demonstrated in many, if not all, patients with infectious mononucleosis. Epstein-Barr virus specific IgM antibodies are observed in the early acute phase of the disease with regularity, indicating a primary Epstein-Barr virus infection. The seroepidemiology of the Epstein-Barr virus based on antiviral capsid antigen determinations provides an explanation for certain epidemiologic features of infectious mononucleosis. Virus can be demonstrated in the oropharynx of nearly every patient by its transforming effect on cord blood leukocytes. Epstein-Barr virus specific diagnostic test procedures are usually not needed in typical patients with high heterophil antibody responses but are necessary in patients in whom these antibodies fail to arise or who exhibit unusual features. Most of the Epstein-Barr virus specific tests, whether serologic or virologic, are as yet too complex for the average diagnostic laboratory to perform. Of the serologic procedures used most extensively, determination of antibodies to the D component of the early antigen complex has been of greatest value, since the mere presence of anti-D is of diagnostic significance. Antiviral capsid antigen, unless showing rises in titers or very high titers, has been of limited value. An Epstein-Barr virus specific serodiagnosis can be established by these two procedures in well over 80% of the patients with infectious mononucleosis. It is suggested that tests for Epstein-Barr virus specific IgM antibodies will become the most dependable and sensitive serodiagnostic procedure. (83 references)

3610 RNA AND DNA FORMS OF THE GENETIC MATERIAL OF C-TYPE VIRUSES AND THE INTEGRATED STATE OF THE DNA FORM IN THE CELLULAR CHROMOSOME. *(E.)* Hill, M. (Inst. Oncol. Immunogenetice, Villejuif, France) and J. Hillova. *Biochim Biophys Acta* 355(1): 7-48, 1974.

Evidence is presented showing that C-type RNA viruses carry several species of RNA and a small amount of DNA. The major nucleic acid component of mature virus particles is 60-70S RNA. This RNA holds, by hydrogen bonds, low-molecular weight RNA species and releases them upon melting. Denatured RNA apparently dissociates into 35-40S subunits migrating faster during electrophoresis and sedimenting slower in velocity gradients than the original 60-70S RNA. Poly(A) sequences found in viral RNA suggest that this RNA has a potential capacity to serve as messenger in virus-producing cells. Biochemical studies indicate that the RNA subunits of helper-independent Rous sarcoma virus are larger than those of helper-dependent RSV and avian leukosis virus. Genetic studies show that the transformation capacity and host-range specificity of helper-independent sarcoma viruses and leukosis viruses may recombine as two independent genetic markers. Virus particles carry RNA-directed DNA polymerase able to generate (from primer 3'-OH ends) covalently bound DNA strands complementary to the RNA template. Upon infection new virus-specific base sequences appear in the chromosomal DNA of infected cells. Virus-infected and -transformed cells share a DNA form of the viral genome, infectious proviral DNA; this DNA contains all the necessary genetic information to give rise to the virus. Sedimentation analysis of Rous sarcoma cell DNA has shown that proviral DNA is covalently bound to large chromosomal DNA. Experimental data on the properties of the DNA form of viral genome justify the concept that viral replication involves reverse transcription of the RNA form of virus genome and insertion of the virus-specific DNA into the cellular chromosome. A model is proposed to account for (1) the infectivity of single- and double-stranded DNA, (2) the apparent length of infectious proviral DNA inferior to that corresponding to viral RNA of 10 x 10^6 daltons, and (3) the segregation of transformation defective viruses and the recombination between genomes of different viruses. (275 references)

3611 CELL HYBRIDIZATION AND CANCER. *(E.)* Watkins, J. F. (Sir William Dunn Sch. Pathol., Oxford, England). *J Clin Pathol* [*Suppl*] 27(7):16-18, 1974.

When suspensions of two different kinds of cells are mixed with inactivated Sendai virus, clumps of cells are formed containing both cell types. Hybrid cells are then formed which may continue to divide to form a hybrid clone. Surface antigens of both parents are expressed on the hybrids. Cell fusion of this type has been used in attempts to recover virus from virus-transformed cells, in the genetic analysis of malignancy, and tumor antigen analysis. Simian virus 40 can be recovered from transformed cells by fusion with permissive cells, while the related polyoma virus cannot be recovered under these circumstances. This approach can be used to recover C-type RNA viruses in situations where the virus has transformed cells of a species other than its natural host. The application of cell fusion to the search for a human tumor virus might be worthwhile although difficulties might be encountered in finding a cell line permissive for the putative virus. Studies to determine whether hybrid cell lines between malignant and nonmalignant cells would be malignant or nonmalignant have produced variable results. As far as human tumors are concerned, genetic analysis has no part to play unless interspecific hybrids can be made which turn out to be malignant. This would support the view that malignancy is a positive genetic character which may be associated with a specific chromosome. Using standard methods of somatic cell genetics, cell hybridization studies could be used to assign human tumor antigens to specific chromosomes. (7 references)

3612 CATS AND CANCER. *(E.)* Levy, J. A. (Cancer Res. Inst., U. California, San Francisco). *JAMA* 229(12):1654-1655, 1974.

A virus causing lymphoma and leukemia in cats spreads horizontally to susceptible hosts; the leukemia virus can be found in the saliva, trachea, and urine of unaffected as well as leukemic cats. This cat virus grows exceedingly well in human cells *in vitro* and can produce experimental tumors in newborn dogs and monkeys. On the other hand, dogs do not have a higher incidence of cancer when raised in same household with leukemic cats, no cat leukemia virus antigen has been detected in any natural dog tumor, and no detectable antibody to any of the antigens of the cat leukemia virus have been detected in the sera of humans exposed to leukemic cats. Although a xenotropic C-type virus is found in cats, it has not been linked to any cancer in that species, antibody titers to this virus are rarely found in cats and have never been found in humans, and viral antigens have not been noted in human cancer tissues. While no clear connection has been found between cat C-type viruses and human malignant neoplasms, all sick cats should be examined by a veterinarian and those from households with other cats should be checked for presence of the feline leukemia virus. The development of a vaccine for cats would offer a real promise for the control of this virus. (6 references)

3613 THE ROLE OF MACROPHAGES IN DEFENSE AGAINST NEOPLASTIC DISEASE. *(E.)* Levy, M. H. (Dep. Microbiol., Thomas Jefferson Univ., Philadelphia, Pa.) and E. F. Wheelock. *Adv Cancer Res* 20:131-163, 1974.

A review of research on the role of macrophages in tumor resistance is presented. Macrophages appear to be essential for uptake and processing of tumor antigens preceding initiation of immune response. They also may stimulate proliferation of lymphocytes by production of lymphocyte activating factor or by delivery of adjuvant. Aided by cytophilic antibody, specific macrophage arming factor, migration inhibition factor, interferon, nonspecific opsonins or nonspecific activation, macrophages alone or in concert with other immune cells can exert both immune and nonimmune cytotoxicity toward tumor cells. Although there are some reports of contradictory data, it appears that macrophages contribute to host defense against neoplastic disease. (272 references)

3614 THE MOST IMPORTANT IMMUNOLOGICAL FACTORS IN CARCINOGENESIS. *(Fr.)* Melki, G. (Fac. Med., Rennes, France). *Cah Med* 14(10):821-237, 1973.

Clinical and experimental arguments supporting the immonosurveillance theory of cancers are reviewed. *In vivo* and *in vitro* experimental evidence supporting the theory of immunostimulation of tumors is also reviewed. The two theories seem to complement each other since highly antigenic tumors respond to immunosurveillance, while weakly antigenic tumors appear to respond to immunostimulation. Viral- and chemical-induced tumors tend to be highly antigenic, and spontaneous tumors tend to be weakly antigenic. The immunological antitumor defenses of an organism are not limited to cytotoxic antibody and cytodestructive T-lymphocyte production, but seem to include such mechanisms as regulation by contact with adjacent normal tissue. The production by the host of factors which block the cytotoxic action of lymphocytes must also be considered. (122 references)

3615 A NEW FUNCTIONAL-MORPHOLOGIC APPROACH TO NON-HODGKIN'S MALIGNANT LYMPHOMAS. *(Fr.)* Gerard-Marchant, R. (Gustave-Roussy Inst., Villejuif, France). *Bull Cancer (Paris)* 61(1):1-9, 1974.

Recent developments in the immunologic and embryologic classification of lymphocytes are reviewed. There is a series of T-lymphocytes which carry cellular immunity and a series of B-lymphocytes which carry humoral immunity. A malignant lymphoma containing T-lymphocytes is characterized by anisocytosis associated with a homogeneous appearance of cell organelles and convoluted nuclei. This lymphoma is frequently associated with leukemia and sometimes with peripheral adenopathy. Four principal types of neoplasms contain B-lymphocytes: chronic lymphoid leukemia, centrofollicular cell tumors, lymphoplasmocytoid lymphoma, and immunosarcoma B. True reticulum cell sarcomas appear to be rare. (19 references).

3616 CARCINOEMBRYONIC ANTIGEN - IMMUNOCHEMISTRY, PHYSICAL CHEMISTRY AND CLINICAL IMPLICATIONS. *(E.)* Banjo, C. (Montreal Gen. Hosp., Canada), J. M. Gold, J. Shuster and P. Gold. *Isr J Sci* 10(8): 856-865, 1974.

The physical chemistry of carcinoembryonic antigen, including purification, chemical composition, tumor-specific antigenic grouping, humoral immunity, and cellular localization are reviewed as are clinical

s of radioimmunoassay for carcinoembryonic antigen.
e carcinoembryonic antigen is a glycoprotein consti-
ent of entodermally-derived human digestive organ
ncers, and is found in the digestive system of the
man embryo and fetus during the first two trimesters
gestation. Carcinoembryonic antigen is released
to the circulation of patients bearing digestive
stem cancers, where it may be detected by radio-
munoassay. Studies performed to date suggest that
dioimmunoassay for carcinoembryonic antigen may
rve as a useful adjunct in the diagnosis and prog-
sis of patients with cancers of the digestive sys-
m and other organs. Carcinoembryonic antigen
okes a humoral, tumor-specific anti-carcinoembryonic
tigen antibody response in the patients, but does
t appear to be involved in stimulating cell-media-
d immunity. Although purified carcinoembryonic an-
gen preparations appear to be homogeneous when stu-
ied by ultracentrifugation and immunoprecipitation
gel media, a number of other chemical, physical,
d immunochemical studies suggest some degree of
termolecular heterogeneity between and within pur-
ied preparations. Evidence has also accumulated
ich suggests intramolecular heterogeneity of the
rcinoembryonic antigen molecule. Investigations
the structure of the immunodominant tumor grouping
f the carcinoembryonic antigen moiety indicate a
lose involvement of the heterosaccharide portion of
he molecule. (56 references)

617 GROUP ANTIGENS AND ANTIGENIC DETERMINANTS OF REVERSE TRANSCRIPTASE IN TYPE C ONCORNA-
IRUS. *(Fr.)* Gomard, E. (Cochlin Hosp., Paris,
rance) and J. P. Levy. *Pathol Biol* (Paris) 22(7):
21-632, 1974.

ucleocapsid group antigens of type C oncornaviruses
re reviewed with respect to the evidence for their
xistence, the double subspecificity of the antigen,
ntraviral localization, biochemical nature, loca-
ion of the antigen in tissue, possible cellular
ontrol of the expression of the antigen and the
ailure of the infected host to produce many anti-
odies. The biological role of these antigens is
ompletely unknown. The antigenic determinants pres-
nt on oncornavirus reverse transcriptases are also
iscussed. They seem to have no relation to the an-
igenic determinants of viral DNA polymerases. (136
eferences).

618 THE MEANING OF THE EMBRYOGENESIS FOR THE ORIGIN OF BONE TUMORS. *(Ger.)* Pliess, G.
Inst. Pathol., Nuremberg, Germany). *Verh Dtsch Ges
athol* 58:430-433, 1974.

rimary bone tumors are classified on the basis of
heir embryological origin. Differences in the bio-
logical behavior of primary bone tumors, in spite of
heir histologically identical structure, are due to
ifferences in their embryological origin. Cartil-
aginous exostosis is due to temporary blockage of the function of the "parossal" osteoblastema in which the metaphyseal blastema induces an ectopic proliferating and maturing metaphyseal cartilaginous blastema. Juvenile cortical defects are caused by transitory thinness of bone growth in the "parossal" osteoblastema. Albers-Schonberg's osteopetrosis is caused by blockage of the differentiation of the metaphyseal blastema into the three "enossal" blastemas. Dermatofibroma lenticulare can be traced back to vestiges of the scleroblastema in the external fibrous periosteal layer, while "parossal" chondromas and chondrosarcomas originate in embryonic vestiges of the skeletoblastema in the fibrous periosteal layer. "Parossal" fibrosarcoma and osteogenic sarcoma originate in proliferating zones of the periblastema. Enchondromas are probably due to a transitory reduction in the induction of the metaphyseal and epiphyseal blastema. The blastema tumors of the bone must be distinguished from tumors with cellular differentiation, as the latter are tumors of the bone marrow. (3 references)

3619 CHRONIC MYELOMONOCYTIC LEUKEMIA IN ADULTS. *(E.)* Miescher, P. A. (Dept. Med., U. Geneva, Switzerland) and J. J. Farquet. *Semin Hematol* 11(2):129-140, 1974.

The paper reviews a chronic form of myelomonocytic leukemia occurring mostly in elderly adults and characterized by an apparent proliferation of mature monocytes in the bone marrow. The onset of the disease is slow and insidious, the most frequent symptom being a feeling of weakness for several months and tendency to bruise easily. At the time of diagnosis the physical examination reveals a slightly enlarged spleen and liver in about a third of the patients. Laboratory findings include a tendency to macrocytosis and myeloproliferation, either discrete or comprising as much as 50% of the bone marrow. Histiocytic series and plasmocytic series are unrevealing. Little can be said with regard to therapy; in fact, chemotherapy seems to be contraindicated, at least in the early phases of the disease. Two hypotheses are offered as to the connection between the myeloproliferation of the bone marrow and the monocytic proliferation seen in the peripheral blood: 1) the leukemic process may involve proliferation as well as maturation in the two potential developmental directions of the common precursor cells of monocytes and granulocytes, and 2) the process may involve the proliferation and pathologic maturation of young myelocytes, some of which would mature to resemble, but not become, monocytes. It is not possible to decide which of the two hypotheses is correct until additional cytochemical and functional studies have been performed. Two further possible considerations are posed to answer the query of diminished platelets in the presence of a normal number of megakaryocytes: 1) increased destruction of platelets through a hypersplenism type of mechanism; and 2) ineffective thrombocytopoiesis as part of megakaryocytic involvement. Again, it is not possible to determine which mechanism is operative. (25 references)

3620 RECENT CONCEPTS IN THE DEVELOPMENT OF COLON CANCER. *(E.)* Lipkin, M. (Sloan-Kettering Cancer Ctr., New York, N.Y.). *Clin Bull* 4(1):7-11, 1974.

Research data suggest a relationship between an individual's environment and dietary intake and his potential for developing colon cancer, particularly of the sigmoid colon. Heredity also seems to play an important role in the development of colon cancer. The best known of the hereditary diseases associated with colon cancer are the familial polyposis syndromes. The major kinetic changes found in the development of colon cancer can be grouped in two phases. When a Phase 1 proliferative lesion is present in colonic epithelial cells, the overall kinetics of cell proliferation remain normal without an accumulation of cells. During their migration through the mucosa, these colonic epithelial cells no longer repress DNA synthesis, and begin to develop an enhanced ability to proliferate. The beginning of a net retention of cells in the mucosa indicates the onset of a Phase 2 proliferative lesion. This change occurs early in age and is widespread throughout the colon in familial polyposis as adenomatous polyps form. Similar findings appear in mice developing colonic cancer following the administration of a carcinogenic agent, and in human hyperplasia. Other abnormal features of cell growth and differentiation accompany the evolution of these changes in the colon: thymidylate synthetase and thymidine kinase activities decrease during the migration of colonic epithelial cells in man; nucleotide precursor enzymes catalyzing steps leading to DNA synthesis decrease in activity; and as colonic cells develop the Phase 2 characteristics, thymidine kinase activity remains high. The data support the view that one or more chemical carcinogens are involved in the neoplastic transformation of colon cells. To solve this problem, a number of areas of investigation are proposed. (19 references)

3621 STRUCTURE AND FUNCTION OF CHROMATIN. *(Ger.)* Harbers, E. (Med. Acad., Lubeck, W. Germany) and W. Sandritter. *Klin Wochenschr* 51(13):631-643, 1973.

The structure of cell chromatin serves as an indicator of the genetic function of the cell. Microscopically, two types of chromatin can be distinguished: condensed, heteropyknotic or heterochromatic chromatin, which is genetically inactive, and noncondensed, isopyknotic or euchromatic chromatin, which is genetically active. Cytogenetically, heterochromatin can be distinguished from euchromatin, but the distinction is not the same as the above. Both hetero- and euchromatin can appear in both hetero- and isopyknotic forms. Therefore, one can speak of a process of "heterochromatization" of the cell's euchromatin, meaning a retardation of the cell's genetic activity. In the process of ageing or carcinogenesis heterochromatization can be cause or effect of pathological cell processes. Eu- and heterochromatic structures in normal and pathological cells can be measured quantitatively by cytophotometry and computer-analysis of optical density distributions. The essential part of chromatin, deoxyribonucleoprotein (DNP), consists mainly of DNA and proteins (histones and non-histones). Part of the DNA, satellite DNA and repetitive base sequences interspersed throughout the strand do not carry information for protein synthesis, but may serve as a turn-on or -off mechanism for gene groups, or as planned "breaking points" for the recombination of genes. Histones play a part in determining the third and fourth degree structures of the DNP (superhelices and heterochromatization), which determine the availability of genetic information. The role of non-histones is not yet clear. The progressive limitation of availability of genetic information during the specialization process of the cell - through formation of third and fourth degree structure - does not stop at cell maturity, but continues in ageing. Pathological changes in this process can lead to the death of a cell, if elementary functions of cell metabolism are disturbed, or to carcinogenesis, if specific growth control functions are disturbed. Carcinogenesis can be linked to increased heterochromatization. These findings, however, are solely of a descriptive nature, and no statements about the causes of chromatin changes can yet be made. (120 references)

3622 HORMONE EFFECT ON INTRACELLULAR REGULATORY MECHANISMS. *(Rus.)* D. Ia. Podgaietskaia (Institute of Cytology, USSR Acad. Sci., Leningrad). *Tsitologiia* 15(9):1067-1079, 1973.

A review of prior literature is made on the mode of hormonal action on intracellular regulatory mechanisms. Experimental studies of the interaction between steroid hormones and chromosome DNA and proteins are discussed with a view to the possible direct hormonal action on the chromosomes. The hormonal action is also shown to affect RNA synthesis. Available data indicate that hormones may act as regulators on the translational level. A hormone-receptor complex is essential for hormonal activity. Apparently, the receptor protein is the substance responsible for the specificity of the tissue-hormone reaction. Cyclic adenosine monophosphate is shown to be involved in the hormonal regulation of protein synthesis. (110 references)

3623 THE ROLE OF PRENATAL EVENTS IN DETERMINING CANCER RISKS IN PROGENY. *(E.)* Tomatis. L. (Int. Agency Res. Cancer, Lyon, France). *Biochem Soc. Trans* 2(4):703-705, 1974.

An observed association between some common childhood cancers and congenital deformities has led to the hypothesis that these tumors may be induced by an agent which is both teratogenic and carcinogenic. Experimental evidence relating prenatal exposure to carcinogens and the appearance of tumors in progeny has been accumulated in animal systems for at least 29 substances. Prenatal exposure has been determined or strongly suspected to increase the cancer risk for man in at least three instances: 1) irradiation during pregnancy 2) stilbestrol therapy during pregnancy and 3) viral diseases (esp. parainfluenza and chicken pox) during pregnancy. Cancer in children could be caused by a carcinogenic factor acting at the prenatal, neonatal, or prenatal and neonatal ages; one cannot overlook the effects of a prezygotic event. As exemplified by the tumor development in the genital tract of daughters of women receiving stilbestrol therapy during pregnancy, prenatal exposure to a carcinogen does not limit the risk of cancer to childhood. (19 references)

4 CHANGES IN GROWTH CONTROL AND GROWTH REQUIRE-
MENTS ASSOCIATED WITH NEOPLASTIC TRANSFORMA-
N *IN VITRO*. *(E.)* Paul, D. (Salk Inst., San Diego,
if.), M. Henahan and S. Walter. *J Natl Cancer Inst*
5):1499-1503, 1974.

dies on different aspects of control, by serum and
rients, of the cell cycle in normal and virus-
nsformed cells are reviewed. The serum factor re-
rement of untransformed 3T3 mouse fibroblasts is
ferent from that of simian virus 40-transformed
(SV-3T3) cells. Fractionated serum contains 3
ferent growth-stimulating factors affecting the
wth of 3T3 or SV-3T3 in different ways. One serum
tor (II) stimulates 3T3 cell growth but has no
ect on SV-3T3 cell growth; 2 serum factors (I,
) stimulate the growth of SV-3T3 cells but not
t of 3T3 cells. The change in serum factor require-
t of 3T3 cells after transformation with SV40
ears to be associated specifically with the malig-
t state of the cells, since chemically transformed
B/3T3 cells and polyoma virus-transformed BHK cells
play a serum factor requirement similar to that of
3T3 cells. The growth rate of 3T3 and SV-3T3 cells
proportional to the serum concentration in the cul-
e medium. Maximal growth rate of 3T3 cells is
ained at about 4% calf serum whereas SV-3T3 cells
w at maximal rate with more than 0.5% calf serum.
lengths of G_1, S, and G_2 in SV-3T3 cells vary
h the growth rate; in 3T3 cells the lengths of S
G_2 are constant and independent of the growth
e, whereas G_1 varies widely. Density-inhibited
a cells in suspension are arrested in G_0 but start
wing again when cells are plated in plastic tissue
ture dishes in the depleted spinner medium. This
gests that membrane alterations resulting from
l attachment could lead to the initiation of the
wth cycle. Some recent evidence suggests that
tain cells can be arrested and synchronized in G_1
reduction of the concentration of specific amino
ds in the culture medium. Density-dependent inhi-
ion of growth is not a property inherent in normal
ls in culture because at least some malignant cells,
luding human tumor (HeLa) cells in culture have
lost the normal mechanisms that control cell
wth and can be arrested in G_0. As shown for
3T3/SV-3T3-F-101 cells, increasing malignancy
ears to be correlated with decreasing serum factor
uirements and might progress toward complete auto-
y in culture when only nutrients, but no serum to
trol their availability inside the cell, are re-
red for growth in culture. (33 references)

5 EPSTEIN-BARR VIRUS INFECTIONS. *(E.)*
Anonymous. *Can Med Assoc J* 110(1):9-10,
. (No references)

6 CELL SURFACE CONTRIBUTIONS TO THE MALIGNANT
PROCESS. *(E.)* Nachbar, M. S. (New York
Sch. Med., N.Y.), J. D. Oppenheim and F. Aull.
J Med Sci 268(3):122-138, 1974. (121 references)

7 TUMOURS OF THE LUNG. *(E.)* Stunzi, H.
(Dept. Vet. Pathol., U. Zurich, Switzerland),

K. W. Head and S. W. Nielsen. *Bull WHO* 50(1):9-19, 1974. (4 references)

3628 UTILIZATION OF GAS-LIQUID CHROMATOGRAPHY COUPLED WITH CHEMICAL IONIZATION AND ELECTRON IMPACT MASS SPECTROMETRY FOR THE INVESTIGATION OF POTENTIALLY HAZARDOUS ENVIRONMENTAL AGENTS AND THEIR METABOLITES. *(E.)* Oswald, E. O. (Natl. Inst. Health, Bethesda, Md.), P. W. Albro and J. D. McKinney. *J Chromatogr* 98(2):365-448, 1974. (313 references)

3629 ASPECTS OF CANCER IMMUNITY. *(Afr.)* Diedericks, B. J. S. (Orange Free State U., Bloemfontein, South Africa). *S Afr Cancer Bull* 18(2):68-83, 1974. (5 references)

3630 THE VIRAL GENESIS OF HUMAN TUMORS: ROUND TABLE DISCUSSION. *(Ger.)* P. K. Vogt (No affiliation). *Verhandl Dtsch Ges Inn Med* 79: 572-574, 1973. (No references)

3631 CELLULAR PATHOLOGY AND UTERINE CANCER. (*E.*) Reagan, J. W. (Inst. Pathol., Case Western Reserve U., Cleveland, Ohio). *Am J Clin Pathol* 62(2):150-164, 1974. (49 references)

3632 TWO ENTITIES IN ANGIOLIPOMA. A STUDY OF 459 CASES OF LIPOMA WITH REVIEW OF LITERATURE ON INFILTRATING ANGIOLIPOMA. *(E.)* Lin, J. J. (U. Kansas Sch. Med., Kansas City) and F. Lin. *Cancer* 34(3):720-727, 1974. (12 references)

3633 FACTORS IN THE GENESIS OF LEUKEMIA. *(Ger.)* Seidel, H. J. (Dept. Clin. Physiol., U. Ulm, Germany). *Verhandl Dtsch Ges Inn Med* 79:267-276, 1973. (33 references)

3634 CELL KINETICS OF LEUKEMIA CELLS IN ACUTE LEUKEMIA IN MAN. *(Ger.)* Killmann, S. A. (Rigshospital, Copenhagen, Denmark). *Verhandl Dtsch Ges Inn Med* 79:276-283, 1973. (19 references)

3635 EPOXIDES IN POLYCYCLIC AROMATIC HYDROCARBON METABOLISM AND CARCINOGENESIS. *(E.)* Sims, P. (R. Cancer Hosp., London, England) and P. L. Grover. *Adv Cancer Res* 20:165-274, 1974. (427 references)

3636 ETIOLOGY OF CANCER OF THE HUMAN OVARY: A REVIEW. *(E.)* Lingeman, C. H. (Natl. Cancer Inst., Bethesda, Md.). *J Natl Cancer Inst* 53(6): 1603-1618, 1974. (157 references)

3637 THE REPLICATION OF RNA TUMOR VIRUS. *(E.)* von der Helm, K. (No affiliation). *Recent Results Cancer Res* 44:21-29, 1974. (37 references)

3638 STRUCTURAL COMPONENTS OF RNA TUMOR VIRUSES. *(E.)* Bolognesi, D. P. (Duke Univ. Med. Cent., Durham, N. C.). *Adv Virus Res* 19:315-359, 1974. (252 references)

3639 ACTIVATION OF MAMMALIAN LEUKEMIA VIRUSES. *(E.)* Hirsch, M. S. (Harvard Med. Sch., Boston, Mass.) and P. H. Black. *Adv Virus Res* 19:265-313, 1974. (333 references)

3640 TUMOR CELL SURFACES: GENERAL ALTERATIONS DETECTED BY AGGLUTININS. *(E.)* Rapin, A. M. C. (Dep. Biochem., Univ. Basel, Switzerland) and M. M. Burger. *Adv Cancer Res* 20:1-91, 1974. (475 references)

3641 CANCER, DIFFERENTIATION AND EMBRYONIC ANTIGENS: SOME CENTRAL PROBLEMS. *(E.)* Coggin, Jr., J. H. (Dep. Microbiol., Univ. Tennessee, Knoxville) and N. G. Anderson. *Adv Cancer Res* 19:105-165, 1974. (228 references)

3642 PRINCIPLES OF IMMUNOLOGICAL TOLERANCE AND IMMUNOCYTE RECEPTOR BLOCKADE. *(E.)* Nossal, G. J. V. (Walter-Eliza Hall Inst. Med. Res., Melbourne, Australia). *Adv Cancer Res* 20:93-130, 1974. (122 references)

3643 CELL-MEDIATED IMMUNITY TO TUMOR CELLS. *(E.)* Herberman, R. B. (Natl. Cancer Inst., Bethesda, Md.). *Adv Cancer Res* 19:207-264, 1974. (363 references)

3644 THE IMMUNE RESPONSE TO ONCORNAVIRUS INFECTIONS. *(E.)* Essex, M. (No affiliation). In: *Viruses, Evolution and Cancer: Basic Considerations* edited by E. Kurstak and K. Maramorosch, New York, Academic Press, 1974, pp. 513-548. (231 references)

3645 IMMUNOLOGY AND THE MELANOMAS. *(E.)* Lewis, M. G. (No affiliation). *Curr Top Microbiol Immunol* 63:48-84, 1974. (159 references)

3646 RESPIRATORY INFECTIONS AND THE PATHOGENESIS OF LUNG CANCER. *(E.)* Nettesheim, P. (Oak Ridge Natl. Lab., Tenn.), H. Schreiber, D. A. Creasia and C. B. Richter. *Recent Results Cancer Res* 44:138-157, 1974. (52 references)

3647 SKIN CANCER. *(E.)* Siddiqui, S. (Augustana Hosp., Chicago, Ill.). *Med. Trial Tech Q* 21(2):163-169, 1974. (No references)

3648 SURVEY OF CANCER OF THE DIGESTIVE TRACT. *(E.)* Schwartz, R. S. (Augustana Hosp., Chicago, Ill.). *Med Trial Tech Q* 21(2):187-197, 1974. (5 references)

3649 DOUBLE PRIMARY MALIGNANT NEOPLASMS. *(E.)* Tan, B. C. (Outram Road Gen. Hosp., Singapore). *Singapore Med J* 15(3):212-217, 1974. (10 references)

3650 CANCER GENETIC PROBLEMS: HOST-ENVIRONMENTAL CONSIDERATIONS. *(E.)* Lynch, H. T. (Sch. Med., Creighton Univ., Omaha, Nebr.) and A. R. Kaplan. *Prog Exp Tumor Res* 19:333-352, 1974. (58 references)

3651 EXPERIMENTAL TUMORS OF THE NERVOUS SYSTEM: MORPHOLOGY AND MORPHOGENESIS. *(E.)* Mennel, H. D. (No affiliation). *Recent Results Cancer Res* 44:158-169, 1974. (44 references)

3652 GENETICS OF HUMAN LEUKEMIA. *(E.)* Gunz, F. W. (Sydney Hosp., Australia). *Ser Haematol* 7(2):164-191, 1974. (181 references)

3653 CELL PROLIFERATION KINETICS AND CARCINOGENESIS: A REVIEW. *(E.)* Iversen, O. H. (Inst. Pathol., Univ. Oslo, Norway). *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:21-29. (68 references)

3654 ADDENDUM TO "MOLECULAR REPAIR, WOUND HEALING, AND CARCINOGENESIS: TUMOR PRODUCTION A POSSIBLE OVERHEALING?" *(E.)* Haddow, A. (R. Cancer Hosp., London, England). *Adv Cancer Res* 20:343-366, 1974. (190 references)

55 CHEMICAL CO-CARCINOGENESIS: DIFFERENTIAL ACTION OF VARIOUS COMPOUNDS, DEREPRESSION ENDOGENOUS C-TYPE RNA GENOMES, AND INFLUENCE OF IFFERENT GENOTYPES OF MICE. *(E.)* Meier, H. (Jackon Lab., Bar Harbor, Me.) and D. D. Myers. *Bibl ematol* (39):551-573, 1973.

e effects of methylcholanthrene (MCA), 7,12-diethylbenzanthracene (DMBA), ethionine, and azahioprine on viral activity and oncogenicity were nvestigated in a number of different inbred and sogenic strains of mice. C57L/J, SWR/J, BALB/cJ, KR/J, and HRS/J-hr/+ and -hr/hr mice were used ecause of their known differences in genetic origin, ccurrence of spontaneous tumors, and expression of -type RNA virus. MCA (250 μg) or DMBA (60 μg) was njected s.c. into weanling and retired breeder mice f strains AKR/J, SWR/J, C57L/J and HRS/J. Significant interactions existed between treatment, actiation of endogenous C-type RNA genomes, strains f mice, age, and latency and types of tumors prouced. AKR/J mice at 6 months of age or older are rogrammed for leukemia response to chemical carcingens, whereas at younger ages, induced sarcomageneis and leukemogenesis are mutually exclusive. Genoypic programming is also evident in older SWR/J ice where the carcinogen causes a faster induction f the tumor. In low tumor strains there is serological evidence of viral genome activation in parallel with induced tumorigenesis. Inbred strains KR/J, BALB/cJ, and C57L/J are resistant to the induction of hepatomas by ethionine (0.5% in the diet); however a few strains and F_1 hybrids are susceptible to spontaneous hepatomagenesis. The susceptibility and resistance to leukemogenesis in the HRS/J is controlled by alleles at either the hr-locus or a closely linked gene. Repeated i.m. administration of the immunosuppressive drug azathioprine (100 mg/kg), preferentially induced leukemia in heterozygotes (hr/+) and abolished the difference in the natural occurrence of leukemia between the two genotypes (hr/hr and hr/+). Thus, the resistance of heterozygous mice can be converted by azathioprine to leukemia susceptibility. This study indicates the host gene control of both tumorigenesis and expression of function of endogenous C-type RNA tumor virus genomes.

3656 INDUCTION OF ENDOREDUPLICATION IN CULTURED MAMMALIAN CELLS BY SOME CHEMICAL MUTAGENS. *(E.)* Sutou, S. (Nomura Res. Inst., Kanagawa, Japan) and F. Tokuyama. *Cancer Res* 34(10):2615-2623, 1974.

The effects of various chemical mutagens on induction of endoreduplication (increase in ploidy secondary to omission of anaphase separation) in cultured Chinese hamster Don cells was studied. Experiments in which thymidine-synchronized cultures were treated with 4-nitroquinoline 1-oxide (4NQO, 1.0 μg/ml) showed that the greatest endoreduplication response (3.0%) occurred in cells treated for 1 hr from 5-6 hr after release, a period in which most cells were in G_2 phase. Analysis of the cell cycle by autoradiography of pulse ^{3}H-labeled asynchronous cultures treated with 4NQO (0.5 μg/ml for 4 hr) showed that cells exhibiting endoreduplication had a cell cycle time approximately twice that of cells not showing the phenomenon, due primarily to a prolonged S phase (18 *vs* 10 hr) and a slightly lengthened G_2 phase. Cells in late S and especially G_2 phase were most sensitive to induction of endoreduplication. The pattern of chromatid labeling in treated cells indicated that induced cells probably omitted one round of mitosis only to carry out a second round of DNA replication before finally dividing. Diplochromosomes contained aberrations which included gaps, breaks, and rings as well as crossing over. Other mutagenic agents found to induce endoreduplication were: acridine yellow, acridine orange, cyclophosphamide, and captan. Mutagenic agents which did not show inductive ability included ethyl methanesulfonate, *N*-methyl-*N'*-nitro-*N*-nitrosoguanidine and triethylenephosphoramide. Mercaptoethanol, a nonmutagenic agent, also induced endoreduplication.

3657 SPECIFICITY OF EFFECTS OF VARIOUS 'INDIRECT' TERATOGENS AND CARCINOGENS DEPENDENT ON THE DEVELOPMENT OF HYDROXYLASES IN RAT FOETUS. *(E.)* Druckrey, H. (Res. Group Prev. Med., Freiburg, West Germany). *Biochem Soc Trans* 2(4):705-710, 1974.

The teratogenic and carcinogenic effects of 1) dialkylnitrosamines, 2) 1,2-dialkylhydrazines, azo- and azoxy-alkanes, and 3) 1-aryl-3,3-dialhyltriazenes were studied in the fetuses and offspring of pregnant rats injected on days 10, 15 or 22 of a 22-day gestation period. Injection of methyl compounds (e.g., dimethylnitrosamine, 1,2-dimethylhydrazine, azoxymethane 1-phenyl-3,3-dimethyltriazene) into pregnant rats either failed to induce malformations or tumors in offspring or only induced tumors when injected on day 22. In contrast, the corresponding ethyl compounds generally induced a significant percentage of malformations and/or tumors in offspring when injected into pregnant rats as early as the 10th day of gestation. The fact that fetal tissues are highly sensitive to chemical carcinogens early in development and that all the compounds tested are known carcinogens in adult rats suggested that the fetal hydroxylating enzymes necessary for activation of the ethyl compounds are present by the 10th day of gestation while those necessary for activation of the methyl compounds are synthesized much later. These findings support the view that the fetal hydroxylases involved are different and specific not only with respect to substrate but also to the time of synthesis during fetal development. Effects of the methyl compounds were dependent on the route of administration, whereas effects of the ethyl compounds were independent of the route.

3658 PROMOTION OF GROWTH OF TUMOUR CELLS IN ACUTELY INFLAMED TISSUES. *(E.)* Van Den Brenk, H. A. S. (St. Thomas' Hosp., London, England), M. Stone, H. Kelly, C. Orton and C. Sharpington. *Br J Cancer* 30(3):246-260, 1974.

Acute inflammatory reactions were induced in rats by the i.v. injection of cellulose sulfate (CS) or an extract of normal rat lung homogenate (LH), or by i.p. injections of compound 48/80 (condensation product of *p*-methoxyphenethyl-methylamine with formaldehyde). These treatments greatly increased survival and clonogenic growth in the lungs of rats i.v. injected allogeneic W-256 and Y-P388 tumor cells. Increase in the dose of i.v. injected CS caused a logarithmic increase in colony forming efficiency (CFE) of tumor cells in the lungs. CFE was not stimulated by the i.v. injection of rats with pharmacological mediators of inflammation (histamine, 5-hydroxytryptamine, bradykinin, and prostaglandins PGE$_1$ and PGE$_{2\alpha}$) which are released from tissues by agents which induce inflammation. Stimulation of CFE by CS occurred in adrenalectomized rats but was inhibited by treatment of rats with an anti-inflammatory steroid, dexamethasone. CFE was stimulated by CS in tumor immunized rats; the inflammatory state did not prevent the expression of immunity but "rescued" a portion (approximately 20%) of the injected tumor cells from immunodestruction in the lungs. A higher proportion of tumors grew in the paws of rats when a small number of W-256 cells were injected interdigitally into the acute inflammatory swellings produced by the local injection of paws with LH or CS. CS is a "synthetic heparin" which causes marked prolongation of blood clotting time and also increases fibrinolytic activity of the blood. Anticoagulant treatment of rats with heparin did not affect CFE. Thus, there was no direct correlation between blood clotting time and CFE of blood borne tumor cells in the rat. The mechanisms which may be responsible for the nonspecific growth promoting effects of inflammatory reactions induced by various types of tissue injury on tumor induction and growth are discussed.

3659 DETECTION OF MUTAGENIC ACTIVITY IN CIGARETTE SMOKE CONDENSATES. *(E.)* Kier, L. D. (Dep. Biochem., Univ. California, Berkely), E. Yamasaki and B. N. Ames. *Proc Natl Acad Sci USA* 71(10): 4159-4163, 1974.

Smoke condenstates of several types of commercially available cigarettes were tested for the presence of mutagenic compounds using a *Salmonella typhimurium* microsomal test system. This system measures the ability of substances previously activated by rat liver or lung microsomal preparations to revert histidine autotrophs to histidine prototrophs, a process requiring DNA mutation. With this system, control, high-charcoal filtered, and nitrate-treated condensates from as little as 1% of one cigarette were able to produce frameshift mutations. Only the nitrate-treated condensate possessed mutagenic activity without prior rat microsomal activation. Testing of different smoke condensate fractions showed that 59% of the activity of the whole condensate was in basic fractions while 30% was in a weakly acidic fraction. Less than 5% was in neutral fractions. Only nitrate-treated condensates from cigarettes were able to cause base-pair substitution mutations in addition to frameshift mutations. The ability of lung microsomal preparations to activate cigarette smoke condensates suggests that this mechanism may be biologically important in any role that cigarettes may play in lung carcinogenesis.

3660 FRACTIONATION OF CIGARETTE SMOKE CONDENSATE PRIOR TO BIOASSAYS FOR CARCINOGENICITY. *(E.)* Izard, C. (Res. Serv., Management Studies Equipment SEITA, Paris, France), P. Moree-Testa, I. Chouroulinkov, Ph. Lazar and C. Libermann. *Biomedicine* 20(3):205-213, 1974.

A method for fractionating cigarette smoke condensate (CSC) is described. The constituents of CSC are separated into four fractions by the Craig countercurrent distribution technique (CCD1), the solvents being trimethyl-2,2,4-pentane (TMP) and a methanol-acetonitrile mixture (1:1 v/v). Two of these fractions were further subfractionated. An aromatic polycyclic hydrocarbon subfraction representing 0.3% of the initial CSC was isolated from one fraction by silicic acid chromatography using TMP as eluent. From the other fraction, three subfractions were obtained using Craig's technique with aqueous methanol (1:9 v/v) and TMP as solvents. The reliability of the fractionation technique was tested by making repeated analyses, combined with repeated bioassays, of the CCD1 fractions. The first fraction contained the water soluble substances and constituted 69.6% of the CSC (w/w); it contained 98% of the diphenols, 65% of the distillable phenols, 70% of the pyrrolic compounds, and 20% of the nicotinic alkaloids of CSC. The second fraction (16.3% of the CSC) contained 35% of the distillable phenols, 25% of the pyrrolic compounds, and 20% of the alkaloids present in CSC; its major constituent was nicotine. The third fraction (4.7% of CSC) contained 95% of the benzo(a)pyrene in CSC and the polycyclic hydrocarbons. Fraction four (13.65% of CSC) contained the liposoluble substances and a large amount of what was presumed to be solanesol.

3661 STRAIN DIFFERENCES IN THE RESPONSE OF INBRED SYRIAN HAMSTERS TO CIGARETTE SMOKE INHALATION. *(E.)* Bernfeld, P. (Boston Univ. Sch. Med., Mass.), F. Homburger and A. B. Russfield. *J Natl Cancer Inst* 53(4):1141-1157, 1974.

The effect of cigarette smoke inhalation was studied on two inbred strains of male Syrian Golden hamsters differing in their susceptibilities to laryngeal hyperplasia. Groups of 102 animals were exposed to 20% smoke from four 1R1 Kentucky reference cigarettes twice/day, 5 days/wk for up to 100 wk; the smoke was delivered by a modified Walton-reverse-smoking machine. Mortality (50% at 85 wk, 100% at 100 wk), compared with unexposed or sham-smoked controls, was unaffected by cigarette smoking although body wt was reduced by about 14%. Carboxyhemoglobin levels increased by as much as 40% immediately after each exposure but returned to normal in less than 24 hr. Serum triglyceride and virus profiles were unchanged by smoke exposure. Chronic exposure caused 25% and 50% increases in lung wt in the more susceptible and more resistant lines, resp. Over 90% of exposed animals of both strains had hyperplastic or neoplastic laryngeal changes; microinvasive cancer was, however, five times more frequent in the more susceptible strain. Two of the animals in this group developed nasopharyngeal tumors, one of which was malignant. Benign squamous papillomas were seen in the airways of both smoke-exposed strains. The incidence of pulmonary adenomatosis, more common in the less susceptible line, was unaffected by smoke exposure. Clumping of pulmonary macrophages, an indication that smoke had reached the lung, was seen to a greater degree in the less susceptible strain. In neither strain were the incidence of tumors outside the respiratory tract nor the degenerative changes characteristic of aging affected by smoke exposure.

3662 INHIBITION OF PROTEIN SYNTHESIS AND INDUCTION OF HELICAL POLYSOMES IN RAT LIVER BY *N*-HYDROXY-2-FLUORENYLACETAMIDE.

(E.) Popp, J. A. (Temple Univ. Sch. Med., Philadelphia, Pa.) and H. Shinozuka. *Chem Biol Interact* 9(1):37-43, 1974.

Hepatic protein synthesis and hepatocyte ultrastructure were studied in fasted male Wistar rats given a single i.p. injection of *N*-hydroxy-2-fluorenylacetamide (OH-FAA) (10, 20, or 40 mg/kg). *In vivo* labeling of hepatic proteins following injection of an amino acid mixture was depressed more than 70% 2 hr after injection of 20 or 40 mg/kg OH-FAA and by 20% after 10 mg/kg and remained depressed for 24 hr. All 3 concentrations produced morphological changes after 2 and 6 hr which consisted of nucleolar segregation, slight distortion of the parallel arrangement of the rough endoplasmic reticulum, and the appearance among dispersed ribosomal monomers of scattered helical polysomes characterized by double rows of ribosomes arranged in a staggered pattern. Sucrose gradient centrifugation of ribosomes from OH-FAA-treated animals showed a shift to dimer and monomer fractions accounting for 64% of the total ribosomes compared with 27% in controls. After 24 hr, when protein synthesis was still depressed, the rough endoplasmic reticulum was restored, with the reappearance of large numbers of regular polysomes and disappearance of the helical polysomes. It is concluded that the formation of helical polysomes in OH-FAA-treated hepatocytes is probably a direct effect rather than a secondary effect of nucleolar alteration or inhibition of protein synthesis.

3663 RECONSTITUTED HAMSTER LIVER MICROSOMAL ENZYME SYSTEM FOR *N*-HYDROXYLATION OF THE CARCINOGEN 2-ACETYLAMINOFLUORENE.

(E.) Lotlikar, P. D. (Temple Univ. Sch. Med., Philadelphia, Pa.), L. Luha and K. Zaleski. *Biochem Biophys Res Commun* 59(4):1349-1355, 1974.

A procedure is described for the isolation of a cytochrome P-450 fraction from microsomes of normal and methylcholanthrene (10 mg/100 g)-pretreated Syrian golden hamsters. It involved removal of NADPH-cytochrome c reductase activity by treatment with bacterial protease before solubilization with Triton X-100 and precipitation with ammonium sulfate. Neither the cytochrome P-450 nor the reductase fraction alone possessed *N*- or ring-hydroxylating activity toward 2-acetylaminofluorene (AAF). However, reconstitution of these 2 fractions resulted in ability to *N*- and ring-hydroxylate AAF. The fact that the extent of *N*-hydroxylation was low (4.8 nmoles/20 min) when control cytochrome P-450 was combined with either the control or methylcholanthrene-treated reductase fraction and was high (30.6-33.4 nmoles/20 min) when methylcholanthrene-treated cytochrome P-450 was used indicated that the degree of *N*-hydroxylating activity is determined by the source of cytochrome P-450. This represents the first report of successful activation of a chemical carcinogen by a reconstituted cytochrome P-450 enzyme system.

3664 RELATIONSHIPS BETWEEN THE CARCINOGENIC AND MUTAGENIC OR DNA-MODIFYING EFFECTS OF NITROFURAN DERIVATIVES, INCLUDING 2-(2-FURYL)-3-(5-NITRO-2-FURYL) ACRYLAMIDE, A FOOD ADDITIVE.

(E.) Yahagi, T. (Natl. Cancer Ctr. Res. Inst., Tokyo, Japan), M. Nagao, K. Hara, T. Matsushima, T. Sugimura and G. T. Bryan. *Cancer Res* 34(9):2266-2273, 1974.

The mutagenic and DNA-modifying effects of 27 nitrofuran derivatives were studied by means of several rapid microbial assay methods. The mutagenic effects were tested with *Escherichia coli*, B/r WP2 try$^-$ and WP2 try$^-$, hcr$^-$, and with *Salmonella typhimurium*, TA1535, TA1536, TA1537, and TA1538. The DNA-modifying effects were assayed by repair tests with *E. coli*, *rec*$^+$, *rec*A13, and *rec*B21, *S. typhimurium*, TA1978 (*uvr*$^+$) and TA1538 (*uvrB*). Twenty-six of the 27 nitroguran derivatives tested had mutagenic effects on *E. coli*, but none of them had mutagenic effects on *S. typhimurium*. Twenty-five compounds had DNA-modifying effects on *E. coli*, and 24 compounds had effects on the DNA of *S. tryphimurium*. Fifteen of the 27 compounds are known to be carcinogenic. Fourteen of these 15 carcinogenic derivatives had mutagenic effects on *E. coli* and *S. typhimurium*. Nitrofurazone gave positive results on mutagenicity and in repair tests with *E. coli*, but negative results on mutagenicity and in repair tests with *S. typhimurium*. Three derivatives reported as noncarcinogenic also showed positive mutagenic and DNA-modifying effects. One of these, 2-(2-furyl)-3-(5-nitro-2-furyl)acrylamide, is widely used as a food additive in Japan. The necessity for further *in vivo* tests on the carcinogenicities of these three compounds is indicated. The results show that several different microbial systems must be used for detection of potential carcinogens and mutagens.

3665 EARLY CHANGES INDUCED BY 2-ACETYLAMINOFLUORENE IN LYSOSOMES IN RAT LIVER PARENCHYMAL CELLS.

(E.) Berg, T. (Med. Fac., Univ. Oslo, Norway) and T. Christoffersen. *Biochem Pharmacol* 23(23):3323-3329, 1974.

The specific activity and intracellular distribution of 2 lysosomal enzymes, β-glycuronidase and acid DNase, was studied in liver from normal and 2-acetylaminofluorene (AAF)-treated male albino Wistar rats. During the first 6-8 wk of feeding of a diet containing AAF (0.025%), specific activities of both enzymes in liver homogenates increased progressively to levels about 2-fold greater than controls. The changes were reversible following withdrawal of the

AAF-containing diet. Cell fractionation studies showed that the specific activities of both enzymes in hepatocytes from AAF-treated rats were 1) increased 2-fold in the nuclear fraction; 2) increased 14-20% in the mitochondrial fraction; 3) decreased 30-60% in the lysosomal fraction; 4) unchanged in the microsomal fraction; and 5) increased 20-65% in the soluble fraction. Enzyme activities in Kupffer cells were unaffected by AAF. Thus, AAF feeding caused redistribution of both enzymes toward heavier cell fractions, indicating that the lysosomes become enlarged after AAF treatment. These findings are consistent with the hypothesis that carcinogen feeding causes increased cellular autophagy.

3666 HEPATIC ENZYMES IN AFLATOXIN-INDUCED PRECANCER.

(Rus.) Pokrovskii, A. A. (Inst. Nutr., Moscow, USSR), M. Ia. Nikolaieva, N. V. Lashneva, L. V. Kravchenko, K. A. Korovnikov, and V. A. Tutelian. *Vopr Onkol* 20(9):75-79, 1974.

Precancerous changes in the rat liver enzymes induced by aflatoxin administration were studied in Wistar male rats injected i.p. with 40 μg/day of aflatoxin for 30 days (the total dose was equal to that which induces hepatocarcinomas in rats). The animals were sacrificed 9 months after the course of injections was completed. The activity of all lyososomal enzymes decreased significantly, particularly acid RNase, β-glucosidase and β-galactosidase (by 37.3%, 32.3%, and 48.4%, resp.). At the same time a significant increase occurred in the total activity of glucose-6-phosphatase and acetylesterase isoenzymes (29.0 and 13.7%, resp.). In addition, a considerable decrease occurred in the rate of NADPH-dependent lipid peroxidation and in the isoenzymes of NAD-dependent lactate dehydrogenase and phosphofructokinase.

3667 INHIBITION OF NUCLEOSIDE TRANSPORT BY AFLATOXINS AND STERIGMATOCYSTIN.

(E.) Kunimoto, T. (Natl. Inst. Hlth, Tokyo, Japan), Y. Kurimoto, K. Aibara and K. Miyaki. *Cancer Res* 34(5):968-973, 1974.

Aflatoxin B_1 inhibits the transport of uridine and thymidine by HeLa cells and L5178Y cells without appreciable effect on nucleoside kinase reaction or nucleic acid synthesis. A similar effect was observed with other aflatoxins and sterigmatocystin. The inhibition of uridine and thymidine transport by the mycotoxins was linear competitive, and the inhibition constants were essentially the same for uridine and thymidine. The relative magnitude of the inhibition constants, in increasing order, sterigmatocystin and aflatoxins B_1, G_1, B_2, and G_2, indicates that there exists a good correlation between the transport-inhibitory activity and *in vivo* or *in vitro* toxicity. It is concluded that the reported inhibition of nucleic acid synthesis of cultured cells by aflatoxins was attributable to their inhibitory action on cellular nucleoside uptake.

3668 FORMATION OF ACTIVE 40 S RIBOSOMAL SUBUNITS IN LIVER IN THE PRESENCE OF AFLATOXIN B_1.

(E.) Moule, Y. (Inst. Sci. Res. Cancer, Villejuif, France) and A. Sarasin. *Chem Biol Interact* 9(1):1-6, 1974.

The formation of 40S ribosomal particles in the presence of aflatoxin B_1 and their incorporation *in vivo* into polysomes was studied using liver homogenates from male Wistar rats (Commentry strain). The rats were given i.p. injections of ^{14}C-orotic acid and, 3 min later, aflatoxin B_1 (1 mg/kg). They were killed 7 hr later. Total RNP (polysomes + monosomes + ribosomal subunits) were obtained from the liver homogenates of control and aflatoxin-treated animals. The polysomes were dissociated by puromycin incubation, and the buoyant density of labeled polysomal 40S subunits was determined. The action of aflatoxin on 45S preribosomal RNA processing resulted in a lack of formation of 60S subunits. Newly synthesized 40S particles continued to be transferred into the cytoplasm as free particles containing labeled 18S RNA, which had an identical sedimentation pattern as an 18S RNA marker. In a CsCl gradient these particles banded like a labeled peak with a buoyant density of 1.54 g/cm^3. This peak coincided with that corresponding to the 40S subunits originating from control polysomes, indicating that the overall composition of labeled particles was identical to that of 40S particles from controls. The 40S particles synthesized in the presence of aflatoxin B_1 were indistinguishable from their control counterparts in their ability to be incorporated into polysomes and thus to initiate protein synthesis in the rat liver.

3669 ON INFLUENCE OF AFLATOXIN B_1 ON THE PHYSICAL PROPERTIES OF THE AVIAN MYELOBLASTOSIS VIRUS BAI STRAIN A (AMV) AND ON THE BIOSYNTHESIS OF VIRAL NUCLEIC ACIDS.

(E.) Kremen, J. (Med. Fac., Charles Univ., Prague, Czechoslovakia), J. Lexova and J. Sula. *Neoplasma* 21(3):275-283, 1974.

The effect of aflatoxin B_1(15 μg/ml) was studied on the physical properties and nucleic acids of avian myeloblastosis virus (AMV) BAI strain A produced by cultured chicken leukemic myeloblasts. Banding of virus on discontinuous sucrose gradients after aflatoxin B_1 treatment for 90-320 min showed a change in density from 1.16 g/ml (control) to 1.14 g/ml, similar to that seen in toyocamycin-treated cells. Analysis of virions labeled with ^{14}C-uridine or ^{32}P showed that the 65S viral genomic RNA was absent in aflatoxin B_1-treated virus and that only 4S RNA was present. Incorporation of ^{3}H-thymidine into virus-associated 7.5S DNA following synchronization with hydroxyurea was stimulated by about 60% compared with control virions, whereas incorporation into total cellular DNA was inhibited by 58%. It is concluded that synthesis of 65S viral genomic RNA is either completely inhibited or, if synthesized, is rapidly degraded to 4S RNA in aflatoxin-treated virions. The results suggest that 7.5S viral DNA is synthesized independently of 65S RNA or of bulk cellular RNA and DNA.

670 CARBOHYDRATE METABOLISM IN AFLATOXIN B_1 TOXICITY. *(E.)* Raj, H. G. (Vallabhbhai Patel Chest Inst., Univ. Delhi, India) and T. A. Venki-asubramanian. *Environ Physiol Biochem* 4(4):181-187, 1974.

A study was made of the utilization of glucose by aflatoxin B_1-injected one-day-old, male white leghorn chicks. Glycolytic and gluconeogenic enzymes were also studied to assess the extent to which the different processes controlling carbohydrate metabolism are operating in aflatoxin B_1-treated chick liver. The birds were injected with aflatoxin B_1 (2.7 mg/kg i.p.) in 0.1 ml of propylene glycol; controls received propylene glycol alone. The birds were sacrificed 48 hr after toxin administration. Glycogenesis *in vivo* was studied in the livers of control and treated chicks according to the procedure of Langley. Standard methods were used for the glucose tolerance tests and for the assay of enzymes. Aflatoxin B_1 resulted in a marked inhibition of hepatic glycogenesis *in vivo*, and an increased fasting blood sugar level. Blood sugar levels reached a peak of 90 min after glucose administration in both groups; however, in the treated chicks the blood sugar levels 45 min after glucose administration and at subsequent periods were markedly elevated as compared with controls. These differences are suggestive of lowered glucose tolerance in aflatoxin B_1-treated chicks. Aflatoxin markedly inhibited the activities of some glycolytic enzymes (hexokinase, phosphoglucoisomerase, fructose-diphosphate aldolase, and pyruvate kinase). The activities of the key enzymes of gluconeogenesis (pyruvate carboxylase and phosphoenol-pyruvate carboxykinase) were significantly enhanced by aflatoxin, while the activity of fructose diphosphatase was unaffected. The results suggest that prolonged aflatoxin poisoning may lead to decreased food consumption, increased fat oxidation, and come as a result of severe deprivation of carbohydrate utilization.

3671 ON THE NATURE OF THE BINDING OF AFLATOXIN B_{2a} TO RAT HEPATIC MICROSOMES. *(E.)* Gurtoo, H. L. (Roswell Park Mem. Inst., Buffalo, N.Y.) and R. Dahms. *Res Comm Chem Pathol Pharmacol* 9(1): 107-118, 1974.

The *in vitro* binding of aflatoxin B_{2a} to microsomes isolated from the livers of male Sprague-Dawley rats was studied. Washed microsomes (900 mg protein) were incubated for 40 min with either unlabeled or ^{3}H-aflatoxin B_{2a} (6 mg). The aflatoxin-treated microsomes were isolated by thin-layer chromatography after defatting in organic solvents and removal of unbound protein by protease digestion. Under these conditions, aflatoxin B_{2a} bound to hepatic microsomes, the conjugate having a difference spectral peak in the 405 nm region which was similar to that previously seen for aflatoxin B_{2a}-microsomal conjugates and for unbound aflatoxin B_{2a}. The aflatoxin B_{2a}-microsomal conjugate could not be separated by Sephadex gel filtration of by extraction with several solvents ranging widely in polarity. Less than 10% of the microsome-bound ^{3}H was released by precipitation with 8% trichloroacetic acid, suggesting that binding was probably covalent. The complex was, however, susceptible to protease digestion. Based on these findings the following explanation of binding of aflatoxin B_{2a} to microsomal proteins is offered: aflatoxin B_{2a} cleaves in alkaline medium to form dialdehyde derivatives which form Schiff bases with the free amino groups of microsomal proteins.

3672 OXIDATIVE METABOLISM OF AFLATOXIN B_1 BY RAT LIVER MICROSOMES *IN VITRO* AND ITS EFFECT ON LIPID PEROXIDATION. *(E.)* Raj, H. G. (Vallabhbhai Patel Chest Inst., U. Delhi, India), K. Santhanam, R. P. Gupta and T. A. Venkitasubramanian. *Res Commun Chem Pathol Pharmacol* 8(4):703-706, 1974.

Spectral interaction of aflatoxin B_1 with phenobarbital-induced rat liver microsomes and the inhibition of aflatoxin B_1 mixed function oxidase by SKF 525-A revealed the participation of cytochrome P-450 in the oxidative metabolism of the toxin. EDTA-Fe complex, which generally enhances aromatic hydroxylations, was found to be inhibitory to the aflatoxin B_1 oxidative metabolism. Aflatoxin B_1 inhibited microsomal lipid peroxidation when ADP-Fe was the cofactor, confirming that NADPH is preferentially used in its oxidative metabolism. The inhibition was reversed by SKF 525-A.

3673 THE INFLUENCE OF SOME ALKYLATING AGENTS OF THE STRUCTURE OF DNA *IN VITRO*. *(E.)* Walles, S. A. S. (Natl. Board Occup. Saf. Health, Stockholm, Sweden). *Chem Biol Interact* 97-103, 1974.

The effects of three alkylating agents, β-propiolactone (BPL), propylene oxide (PO), and butylene oxide (BO), on the structure of calf thymus DNA were studied *in vitro*. The reversibility of DNA after heat denaturation, as measured by absorbance at 260 nm, was used as a criterion for structural change. Both BO (0.09-0.19 M, 2-7 hr) and PO (0.1 M, 1-6 hr) produced irreversible DNA denaturation at 65 C. About twice the degree of alkylation by PO was necessary to achieve the same effect as with BO; the melting point of BO- and PO-treated DNA was 43 C at 4% alkylation. In contrast, although BPL (6-26 mM, 1-7 hr), like BO and PO, decreased the DNA melting point in proportion to the degree of alkylation, it produced no strand breaks since irreversibility of heat denaturation was not increased. BO and PO, unlike BPL, were able to alkylate DNA guanine residues.

3674 MUTAGENICITY OF PRIMARY AMINES COMBINED WITH NITRITE. *(E.)* Hussain, S. (Wallenberg Lab., Stockholm U., Sweden) and L. Ehrenberg. *Mutat Res* 26(5):419-422, 1974.

Biological tests were conducted on *E. coli* Sd-4 for the mutagenic activity of methyl-, ethyl-, and isopropylamines alone and in combination with nitrite. Methyl- and ethylamine in combination with nitrite were significantly mutagenic. The combination of isopropylamine with nitrite did not yield a detectable increase in mutation frequency over that due to nitrite alone. These experiments demonstrate that primary amines have to be considered in discussions of the danger from nitrite intake through food, water and so on. Owing to the lability of certain of the metabolic intermediates the site of alkylation is expected to be close to the site of formation of the alkylating agent, e.g., the esophagus or the stomach.

3675 SYNTHESES, TOXICITIES, AND CARCINOGENICITIES OF CARCINOGENIC BIFUNCTIONAL AMINOAZO DYES. *(E.)* Lin, J. K. (Coll. Med., Natl. Taiwan U., Taipei) and J. R. Wu. *Cancer Res* 34(9):2274-2282, 1974.

Twelve bifunctional aminoazo dyes, of which eight were newly discovered, were synthesized. These new dyes were 4'-amino-*N*-monomethyl-4-aminoazobenzene, 4'-amino-*N*-acetyl-*N*-monomethyl-4-aminoazobenzene, *N'*-monomethyl-4'-amino-*N*-acetyl-*N*-monomethyl-4-aminoazobenzene (XII), *N'*-monomethyl-4'-amino-*N*-monomethyl-4-aminoazobenzene, *N'*-acetyl-*N'*-monomethyl-*N'*-acetyl-*N*-monomethyl-4-aminoazobenzene (X), *N'*-acetyl-4'-amino-*N*-acetyl-*N*-monomethyl-4-aminoazobenzene, *N'*,*N'*-dimethyl-4'-amino-*N*-monomethyl-4-aminoazobenzene , and *N'*,*N'*-dimethyl-4'-amino-*N*-acetyl-*N*-monomethyl-4-aminoazobenzene (IIIb). When the carcinogenicities of these dyes were tested in Long-Evans and Sprague-Dawley rats, IIIb was found to be approximately 4 times as active as *N*,*N*-dimethyl-4-aminoazobenzene, whereas X and XII were about twice as active. Although all of the other compounds were found to be inactive under the experimental conditions, IIIb was capable of inducing liver tumors in a rather short period of time (2 to 3 months). The acute toxicities of these dyes in young rats were found to be less than that of *N*,*N*-dimethyl-4-aminoazobenzene.

3676 LYMPHOCYTE KARYOMETRY: ITS APPLICATION TO THE STUDY OF THE BIOLOGICAL EFFECTS OF ATMOSPHERIC DUST ON BALB/C LINE MOUSE LYMPHOCYTES. *(Fr.)* Isoard, P. (Res. Ctr., Service de Sante des Armees, Lyon, France), J. Bernheim, S. Fournon-Joly, E. Abrigeon, P. Milhaud, A. Flory, D. Germain, and R. Fontanges. *Biomedicine* 20(2):138-145, 1974.

Variations of the surface of the lymphocytes nucleus were studied by projection microscopic method in BALB/C mice as a function of such factors as sex, age, and exposure to < 10 µ fraction of atmospheric dust applied by deposition on the nasal mucosa, s.c. injection in the dorsolumbar region, or in the form of inhalation aerosol. Contrary to expectations, injected dust failed to stimulate the formation of lymphocytes with large nuclei. Small lymphocytes with long life, an indication of the stimulation of the reticuloendothelial system, were observed. This stimulation was considerable in all animal regardless of the substance injected (dust or solvent). The stimulation was less pronounced following s.c. injection than following administration through the respiratory tract. Atmospheric dust injected s.c. tended to diminish the stimulating effect of carbowax on the reticuloendothelial system. In administration through the respiratory tract, the stimulating effect on the reticuloendothelial system was much more pronounced than the depressive effect.

3677 DETERMINATION OF SERUM 3-HYDROXYANTHRANYLIC ACID FOR IMMUNODIAGNOSIS OF PRECANCEROUS CHANGES IN THE BLADDER MUCOSA. *(Rus.)* Korosteleva, T. A. (N. N. Petrov Inst. Oncol., Leningrad, USSR), B. V. Kliucharev, A. T. Belokhvostova, A. A. Syromiatnikov and T. A. Benteleva. *Biull Eksp Biol Med* 78(12):65-67, 1974.

Protein antigen containing 3-hydroxyanthranylic acid (3-HAA) detected by agar diffusion was used to diagnose occupational precancer and cancer of the bladder in 110 women employed at a textile factory. Urologic examination showed that pathological changes of the bladder mucosa (papillary proliferation, chronic cystitis, trigonitis) tended to be more common in workers handling aniline dyes. Sera of 48 workers contained 3-HAA. The more contact the workers had with the dyes the higher was the incidence of 3-HAA in the sera. A correlation was established between the results of the immunological studies and the urologic examination. The results show that the presence of 3-HAA in the sera is indicative of early precancerous changes in the mucosa.

3678 ARSENIC-INDUCED CHANGES IN NUCLEIC ACID SYNTHESIS *IN VITRO*. *(Ger.)* Petres, J. (Fac. Clin. Med., Univ. Heidelberg, Mannheim, Germany), D. Baron and I. Kunick. *Dermatol Monatsschr* 160(9):724-729, 1974.

The incorporation of ^{3}H-thymidine into DNA and of ^{3}H-uridine into RNA in the presence of inorganic arsenic was studied in phytohemagglutinin-stimulated human lymphocyte cultures. Sodium arsenate was added in concentrations ranging from 0.05 to 100 µg/ml for the last 24 hr of the 72-hr culturing period. Arsenic inhibited the incorporation of thymidine into DNA more strongly than that of uridine into RNA. The lowest inhibiting concentration of arsenic was 0.1 µg/ml for the thymidine incorporation and 10 µg/ml for uridine incorporation. The findings suggest that inorganic arsenic apparently inhibits DNA polymerase more strongly than RNA polymerase. These findings could also be explained by arsenic-induced inhibition of formate incorporation into purines. The inhibitory effect of inorganic arsenic in cell metabolism is attributed to the strong affinity of arsenic for enzymes, particularly those containing -SH groups.

3679 THE EFFECT OF AZATHIOPRIN ON DNA SYNTHESIS, MITOTIC ACTIVITY AND HYPERTROPHY OF CELLS IN THE REGENERATING LIVER AND INTACT SPLEEN IN RATS. *(Rus.)* Z. A. Riabinina (Inst. Human Morphol., Moscow, USSR), V. M. Budik and E. A. Lisnevskaia. *Biul. Eksp. Biol. Med.* 77(11):102-105, 1974.

August line male rats weighing 191 ± 29 g were 2/3 hepatectomized and then divided into 2 groups. The experimental rats were force-fed azathioprin suspension in 1% carboxymethylcellulose (40 mg/kg). Control rats were treated with 1% carboxymethylcellulose only. The experimental and control rats were sacrificed 22, 48, and 72 hr after hepatectomy. One hr before the animals were sacrificed they were injected intraperitoneally with 1 Ci/g of thymidine-H^3. Studies were made of the level of DNA synthesis, mitotic

tivity, and size of cells and nuclei in the re-
nerating liver and intact spleen. The azathioprin
duced by 70% the number of DNA-synthesizing hepato-
tes and inhibited their mitotic activity. It also
duced a marked hypertrophy of the cells in the re-
nerating liver and spleen.

580 FIBROBLAST TRANSFORMATION *IN VITRO* BY BERYLLIUM.

(Ger.) Komitowski, H. D.
German Cent. Cancer Res., Heidelberg). *Verh Dtsch
es Path* 57 :421, 1973.

e *in vitro* transformation of fibroblasts by beryl-
ium was studied in rabbit embryonic cell cultures
ontaining 0.00001 mg/ml beryllium oxide. The mitotic
ndex fell to 30% of the normal value by the 12th day,
t which time changes in the nucleus and cytoplasm
ppeared. These included nuclear polymorphism,
hromatolysis, enlargement of the nuclei, vacuoliza-
ion and extensive process formation in the cytoplasm,
ncrease in mucopolysaccharide granules, cystic re-
rrangement of the endoplasmic reticulum, an increased
umber of lysosomes and cystically dilated canals in the
olgi apparatus. The findings indicate that extra-
ellular beryllium crystals produce a great number of
ellular changes, of which those affecting the cell
urface are most pronounced. These changes may
epresent an adaptive reaction to the altered condi-
ions in the cell environment. The significance of
hese changes for carcinogenesis and the time of ap-
earance of a new tumor cell genome adapted to these
xtreme conditions remain unknown.

3681 HISTOPATHOLOGICAL STUDIES ON LIVER TUMORIGENESIS IN RATS TREATED WITH POLYCHLORI-
NATED BIPHENYLS.

(E.) Ito, N. (Nara Med. Univ.,
Japan), H. Nagasaki, S. Makiura and M. Arai. *Gann*
55(6):545-549, 1974.

Histopathological studies were made on tumorigenesis induced in the livers of 8-wk-old male Wistar rats by polychlorinated biphenyls. Kanechlor-500, Kanechlor-400 and Kanechlor-300 (differing in their percentages of chlorinated biphenyls) were administered to the stock diets of groups of rats in 1000, 500 and 100 ppm quantities, with one group receiving none and acting as a control. After 28-52 wk the 290 rats were killed and the liver was weighed and examined histologically. In the groups receiving the Kanechlor the liver weight increased; the greatest increase was in those that received 1000 ppm Kanechlor-500 (22.2 g as compared with 13 g in the controls). No hepatocellular carcinoma was seen in any of the rats but areas of cholangiofibrosis were found in the livers of rats given 1000 ppm Kanechlor-500, -400, or -300. Nodular hyperplasia was found in 12% of the animals given Kanechlor-500, 12.5% of those given Kanechlor-400, and 4.5% of those given Kanechlor-300. Oval cell proliferation and bile duct proliferation were seen in all groups treated with Kanechlor. In groups that received 1000 ppm of Kanechlor-500 or -400 there were hypertrophic changes of parenchymal cells in centrolobular areas. Amyloid degeneration of the liver was seen only in the group given 100 ppm Kanechlor-400. In these studies the polychlorinated biphenyls induced nodular hyperplasias but not hepatocellular carcinomas in rats; however the histological patterns of the nodular hyperplasias were similar to those induced by other chemical carcinogens, thus suggesting that these lesions may be preneoplastic.

3682 REVERSIBLE "TRANSFORMATION" OF BROMODEOXYURIDINE-DEPENDENT CELLS BY BROMODEOXYURIDINE.

(E.) Davidson, R. L. (Harvard Med. Sch., Boston, Mass.) and D. Horn. *Proc Natl Acad Sci USA* 71 (9):3338-3342, 1974.

The growth characteristics of a bromodeoxyuridine (BUdR)-dependent cell line, B4, derived from the noncontact-inhibited Syrian hamster melanoma line RPMI 3460 were studied. B4 cells grew more rapidly in medium with 0.1 mM BUdR than without (doubling time of 28 *vs* 42 hr) and were not contact-inhibited. When B4 cells were grown in medium without BUdR, they became contact-inhibited at cell densities about 7-fold less than the densities reached in BUdR medium. The cessation of growth at confluence in medium without BUdR was independent of the length of time or the number of population doublings and was not due to loss of cell viability. Cells grown in the medium without BUdR were spindle-shaped and flattened, while cells grown in the presence of BUdR were rounded like the parental melanoma line. High BUdR concentrations (100 μM) were required for optimal growth and maintenance of the noncontacted-inhibited state. The contact-inhibited state and associated morphological changes of B4 cells grown in medium without BUdR could be reversed if BUdR was added during the log phase of culture growth but not after contact-inhibition had been attained. These results suggest that incorporation of BUdR into actively dividing cells is necessary to maintain a contact-inhibited state and further indicate that the effects of BUdR on growth rate and contact inhibition are separable.

3683 BROMOURACIL MUTAGENESIS: MISPAIRING OR MISREPAIR?

(E.) Witkin, E. M. (Rutgers Univ., New Brunswick, N.J.) and E. C. Parisi. *Mutat Res* 25(3):407-409, 1974.

The mechanism of bromouracil (BU)-induced mutagenesis was examined by comparing the mutability of wild type *Escherichia coli* with repair-deficient strains carrying mutations which either enhance (*uvrA*) or diminish (*lexA, recA*) *uv*-induced mutability. Mutation frequency from a thymidine-requiring state to independent state rose rapidly to a maximum 45 min after plating of one hypermutable, two nonmutable and the wild type strains onto BU agar. All four strains produced 50-100 times more mutants on BU agar than on control plates. It is concluded that BU mutagenesis in *E. coli* genes is largely independent of *uvrA*, *recA* and *lexA* gene products and, hence, of the dark repair mechanisms dependent on these products. These results are compatible with the hypothesis that BU mutagenesis is due primarily to mispairing of DNA base analogs during replication and not to faulty repair of BU-induced DNA damage.

3684 HEPATOMAS AND ORAL CONTRACEPTIVES. *(E.)* Berg, J. W. (Dept. Prev. Med., U. Iowa, Iowa City), R. J. Kelelaar, E. F. Rose and R. G. Vernon. *Lancet* (7876):349-350, 1974.

Review of the records of the Iowa State Cancer Registry for the years 1969-1971, showed 4 cases of hepatoma in women between the ages of 23 and 32, an incidence of 0.29/100,000 women/yr. No other instances of liver cancer or borderline tumors were reported for females between the ages of 3 and 42 yr for this period. Based on records, only 1 death from liver cancer should have occurred in this age group over the 3 yr. Three of the 4 women gave a positive history of oral contraceptive use of up to 8 yr. The fourth patient was pregnant when her tumor was diagnosed. All women presented with large liver masses and all died within 1 month, 3 of hemorrhage. All tumors were hepatocellular and the extent of hemorrhage was inversely related to the degree of differentiation. Autopsy showed that all tumors were localized to the liver. Search of University of Iowa files back to 1938 showed no record of a similar tumor in women of this age, and it is concluded that a true increase in the incidence of hepatocellular carcinoma is occurring. Based on available, but incomplete data, the mortality rate for women of this age group who are taking oral contraceptives is at the most 5/100,000/yr.

3685 SPECIFICITY OF ABERRATIONS IN ANIMAL CHROMOSOMES UNDER THE ACTION OF DIPINE. *(Rus.)* Goldman, I. L. (Sci. Res. Inst. Animal Husbandry, Dubrovitsi, USSR) and S. F. Vasilieva. *Dokl Akad Nauk SSSR* 219(6):1482-1485, 1974.

The cytogenetic action of dipine (tetraethyleneimidopiperazine-N,N'-diphosphoric acid) was studied. The agent was injected intraperitoneally into 5 female and 5 male guinea pigs (20 μg/g). Metaphase chromosomes of the bone marrow were isolated after 11-hr exposure to the mutagen. Studies were made of two pairs of autosomes and the X-chromosome. Dipine induced chromatid aberrations of various types were equally distributed within the chromosome pairs under study. The correlation of chromatid and isochromatid splits was 2:1; symmetrical and asymetrical translocations, 1:2; intra- and interchromosomal rearrangements, 9:1. The analysis of intrachromosomal rearrangements revealed their regional specificity. In the chromosomes of the first pair of the karyotype, the aberrations were observed in 10 groups corresponding to the 7 chromatic segments of the chromosomes. The splits were most often observed near the kinetochore. Among inter-chromosomal aberrations, translocations between homologous chromosomes were recorded. The results showed a typical picture of chromosomal aberrations characteristic of alkylating mutagens with a retarded action. The specificity of dipine action consisted in the nonrandom distribution of aberrations concentrating in the sections of the chromosomes readily responding to the dye. It is suggested that the primary genetic effect of dipine is determined by both the chemical structure of the mutagen and the properties of the chromosomes.

3686 COLPOSCOPIC ASPECTS OF MANAGEMENT OF VAGINAL ADENOSIS IN DES CHILDREN. *(E.)* Scott, J. W. (Cedars of Lebanon Hosp., Miami, Fla.), D. Seckinger and W. Puente-Duany. *J Reprod Med* 12(5):187-193, 1974.

Based on seven cases of vaginal adenocarcinoma in 15 to 22-yr-old women, the ingestion of diethylstilbestrol (DES) by pregnant women has been linked with an increased incidence of clear-cell adenocarcinoma of the vagina among their offspring. Cytologic examination alone is unreliable as a diagnostic aid in this condition, careful colposcopic examination of the vagina and cervix being necessary to determine the correct diagnosis. Clear-cell adenocarcinoma of the vagina may originate from true adenosis of the vagina or it may arise from the glandular epithelium seen in the transformation zone. Twenty girls (6 to 22-yr-old) whose mothers took DES during pregnancy have been examined colposcopically. In all patients the cytologic smears from the vagina, cervix, and endometrium were normal, but colposcopy of the cervix and vagina revealed varying degrees of abnormalities in 17 of the 20. The mothers of all patients with severe adenosis had been treated with at least 100 mg/day of DES in the first trimester of pregnancy; the mothers of the three patients without adenosis had been given small doses of DES for relatively short periods and/or relatively late in pregnancy. Two cases are described as illustrative of the colposcopic patterns found. The recommended method of treatment involves removal of all abnormal epithelium from the top of the vagina under colposcopic guidance.

3687 GLYCOSIDASES HETEROGENEITY AMONG DIMETHYLHYDRAZINE INDUCED RAT COLONIC TUMOURS. *(E.)* Mian, N. (Sch. Med., Leeds, England), D. M. Cowen and C. A. Nutman. *Br J Cancer* 30(3):231-237, 1974.

The activities of N-acetyl-β-D-glucosaminidase, N-acetyl-β-D-galactosaminidase, β-D-galactosidase, and α-L-fucosidase were measured in rat colonic tumors induced by 1,2-dimethylhydrazine (DMH). Tumors from different animals and the same animal varied considerably in their enzyme content. Enzymatic heterogeneity among tumors appeared to be related to their site of origin in the colon. The descending colon, which after the DMH treatment showed a significant increase in the levels of glycosidases, also gave rise to a larger number of adenocarcinomas than did other parts of the colon. The relative changes in the activities of four glycosidases seemed to show a good correlation.

3688 THE ROLE OF THE MICROFLORA IN INDUCTION OF INTESTINAL TUMORS IN RATS. *(Rus.)* Pozharisskii, K. M. (N. N. Petrov Inst. Oncol., Leningrad, USSR), B. A. Dushkin and G. I. Podoprigora. *Biull Eksp Biol Med* 77(10):81-84, 1974.

The incidence of intestinal tumors, induced by 1,2-dimethylhydrazine dihydrochloride (DMH) dissolved n distilled water and adjusted to pH 6.5 with sodium icarbonate, was studied in male rats with different intestinal microflora. Five gnotobiotic Wistar AF-49 rats were given *Bacillus subtilis, Clostridium utrefaciens* and *Saccharomyces* and were then injected s.c. with 30 mg/kg/wk of DMH; these rats were kept under microbiologically controlled conditions. In addition, 25 random-bred male rats were given drinking water containing acidophilus milk and, three wk later, injected s.c. with 21 mg/kg/wk DMH. A third group of 15 conventional Wistar rats fed a conventional diet and treated with DMH [dose unspecified] had multiple tumors of the colon when sacrificed 146-164 days after DMH treatment was started; most of these tumors were found in the descending colon. Of these 15 rats, 8 also had tumors in the duodenum and proximal jejunum. One rat had a metastasis in the lymph nodes of the ileocecal angle. Only one of the five gnotobiotic rats had intestinal tumors when sacrificed 178 days after DMH treatment was started: there were two tumors, 2-3 mm in diameter, in the descending colon and one small tumor in the duodenal bulb. All of the rats fed acidophilus milk had multiple intestinal tumors when sacrificed 178-185 days after institution of DMH treatment. These rats had more tumors in the duodenum and proximal jejunum than random-bred conventional rats. (1.8 in comparison to 0.9-1.2 per rat). No comparison could be made of the number of colonic tumors in these two groups of rats since in rats given acidophilus milk these tumors often fused and formed extensive tumor conglomerates. These findings confirm that the intestinal microflora take part in carcinogen metabolism. If, as has been suggested in the literature, DMH is metabolized to compounds which become conjugated with glucuronic acid, *Lactobacillus acidophilus* might have β-glucuronidase activity and liberate the active carcinogen in a part of the intestine which ordinarily contains little microflora.

3689 VITAMIN A COMPOUNDS AND ANALOGS AS INHIBITORS OF MIXED-FUNCTION OXIDASES THAT METABOLIZE CARCINOGENIC POLYCYCLIC HYDROCARBONS AND OTHER COMPOUNDS.

(E.) Hill, D. L. (Southern Res. Inst., Birmingham, Ala.) and T. W. Shih. *Cancer Res* 34(3): 564-570, 1974.

Fourteen vitamin A compounds and analogs were evaluated as inhibitors of microsomal mixed-function oxidases from liver and lung tissues of mice and hamsters. With liver microsomes, benzo(*a*)pyrene (BP) is metabolized, by one pathway, to a hexane-insoluble metabolite (BP-X) which is tightly bound to reaction components. The K_m for BP in this reaction is 10 ± 2 μM. The formation of BP-X is strongly inhibited by retinol and several other vitamin A compounds, some of which have known anticarcinogenic activity, and by butylated hydroxytoluene, also an anticarcinogenic agent. BP-X accumulates in larger amounts in the presence of cyclohexene oxide, an inhibitor of epoxide hydrase. 7,12-Dimethylbenzanthracene and 3-methylcholanthrene are also converted by liver microsomal oxidases to tightly bound metabolites, the formation of which is inhibited by the compounds that block production of BP-X. BP is converted to 3-hydroxy-BP in another metabolic step, a reaction not inhibited by any of the vitamin A compounds. The K_m for BP in this reaction is 8.5 μM. 3-Hydroxy-BP is further metabolized by a microsomal oxidase to a product (BP-Y), which, by mass spectral analysis, contains 2 oxygen atoms. The K_m for 3-hydroxy-BP is 3 μM. The disappearance of this substrate is inhibited by retinol and some of its derivatives and by butylated hydroxytoluene. Enzymes that catalyze the oxidation of cyclophosphamide and nicotine to hydroxy derivatives are also inhibited by the agents that block production of BP-X and metabolism of 3-hydroxy-BP, but amine oxidases that use nicotine and trimethylamine as substrates are not inhibited. Microsomes from the lungs of mice pretreated with benz(*a*)anthracene convert BP to 3-hydroxy-BP but show no detectable formation of BP-X or further metabolism of 3-hydroxy-BP.

3690 DOSE-RELATED INHIBITION OF CHEMICAL CARCINOGENESIS IN MOUSE SKIN BY CAFFEINE.

(E.) Rothwell, K. (Tobacco Res. Counc., London, England). *Nature* 252(5478):69-70, 1974.

Caffeine has been shown to act as an inhibitor of polycyclic hydrocarbon carcinogenesis. Two cyclohexane soluble fractions of cigarette smoke condensate were applied repeatedly to mouse skin either alone or together with caffeine, also at two concentrations. Dose levels of condensate fractions refer to the amount of smoke condensate from which the fraction was derived. From the results it is clear that caffeine alone did not lead to the development of skin tumors. The response at 600 mg dose levels of condensate was, on the average, 2.2 times greater than at 300 mg for benign and malignant tumors and was 2.6 times greater for invasive carcinomas. At the higher caffeine concentration (0.2% of the smoke condensate equivalent), the caffeine significantly reduced tumor incidence; at the lower caffeine concentration (0.04%), there was also a reduction of tumor incidence but the effect was not statistically significant. Possible mechanisms of inhibition of carcinogenesis by caffeine are discussed.

3691 SEPARATION OF MULTIPLE FORMS OF PROTEIN-BOUND METABOLITES OF THE CARCINOGENIC HYDROCARBONS 3-METHYLCHOLANTHRENE AND 7,12-DIMETHYLBENZ(*a*)ANTHRACENE FROM SEVERAL RODENT SPECIES.

(E.) Corbett, T. H. (Biol. Div., Oak Ridge Natl. Lab., Tenn.) and P. Nettesheim. *Chem Biol Interact* 8(5): 285-296, 1974.

(^{3}H)3-methylcholanthrene (MCA) and (^{3}H)7,12-dimethylbenz(a)anthracene (DMBA) were applied to the shaved backs of DBA/2, BALB/c, and BC3F$_1$ mice (20 μg/animal), Syrian golden hamsters (50 μg/animal), and Fischer rats (200 μg/animal). The labeled hydrocarbons were also applied via intratracheal injection to the lungs of rats (0.1 ml/animal), hamsters (0.05 ml/animal), and mice (0.02 ml/animal). Analysis of tissue samples from these animals indicated that DMBA and 3-MCA bind in multiple forms to the proteins of skin and lung tissue. These metabolites are freed from the proteins by treatment with Raney nickel, indicating that the metabolites are most likely bound through cysteine or homocysteine. The numbers and relative quantities of the bound metabolites varied greatly among the various species and mouse strains. Although it is unlikely that the major bound metabolites produced in rat and hamster skin are correlated with high tumor susceptibility, a correlation between high tumor susceptibility and the major bound metabolites found in mouse skin and lung tissues is a possibility.

3692 EFFECT OF BENZO(a)ANTHRACENE ON THE ACTION OF 7,12-DIMETHYLBENZO(a)ANTHRACENE ON NORMAL AND MALIGNANT CULTURED CELLS OF THE HAMSTER.

(Rus.) S. P. Bakulina (Inst. Exp. Clin. Oncol., Moscow, USSR), G. A. Belitskii, M. A. Panov and A. Ia. Khesina. *Tsitologiia* 15(4):467-472, 1973.

In cultures of normal embryonal fibroblasts of the hamster, benzo(a)anthracene (BA) inhibited the toxic action of 7,12-dimethylbenzo(a)anthracene, enhanced its metabolism, and reduced the accumulation of metabolites bound to proteins of the cells and of the culture medium. In cultures of transformed hamster cells (line 610), susceptible to the toxic action of DMBA, BA does not produce the above effect. It is suggested that certain nonresistant tumor cells and normal cells have a different mechanism of susceptibility to the toxic action of carcinogenic polycyclic hydrocarbons.

3693 HEPATIC UPTAKE, METABOLISM, AND BILIARY EXCRETION OF 7,12-DIMETHYLBENZANTHRACENE IN THE RAT.

(E.) Levine, W. G. (Albert Einstein Coll. Med., Bronx, N.Y.). *Drug Metab Dispos* 2(2):169-177, 1974.

Female Wistar rats weighing about 200 g were used in studies of the hepatic uptake, binding, metabolism, and biliary excretion of 7,12-dimethylbenzanthracene (DMBA). ^{3}H-DMBA (5 mg/kg i.v.) was rapidly taken up by the liver, bound to particulate fractions, and subsequently converted to polar metabolites. These metabolites were recovered principally in the cytosol. After transfer to cytosol the metabolites are rapidly excreted in the bile. I.p. pretreatment of rats with phenobarbital (75 mg/kg), 3-methylcholanthrene (20 mg/kg), and DMBA (20 mg/kg), agents that induce microsomal drug-metabolizing enzymes, increased the biliary excretion of metabolites of i.v. ^{3}H-DMBA. I.p. pretreatment with piperonyl butoxide (1.0 ml) or SKF-525 (50 mg/kg), agents that inhibit the drug-metabolizing enzymes, decreased the biliary excretion of ^{3}H-DMBA metabolites. Pretreatment with metyrapone (60 mg/kg i.p.) also decreased the biliary excretion of labeled DMBA metabolites, but had no effect on ^{3}H-DMBA metabolism measured in 10,000 g supernatant fraction of rat livers. When added directly to incubation mixtures, metyrapone did inhibit metabolism at concentrations greater than 3×10^{-5} M. Injected metabolites of 7,12-dimethylbenzanthracene appear to be taken up directly into the cytosol; their rate of excretion is far more rapid than when the hydrocarbon itself is injected.

3694 CARCINOGENIC ACTION OF 7,12-DIMETHYLBENZ(a)ANTHRACENE (DMBA) IN RATS EXPOSED TRANSPLACENTALLY.

(Rus.) Aleksandrov, V. A. (N. N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR) and N. P. Napalkov. *Vopr Onkol* 20(8):50-54, 1974.

Transplacental carcinogenic action of 7,12-dimethylbenz(*a*)anthracene (DMBA) was studied in 16 pregnant mice and 32 offspring surviving until the manifestation of the primary tumor. The pregnant mice were injected with 15 mg/kg DMBA on the 21st day after conception. Tumors were discovered in 25 of the 32 surviving progeny. In 13 rats 16 neoplasms were localized in the central and peripheral nervous system; 11 tumors were found in the kidneys. The first tumor in the progeny was discovered 195 days after the injection. In the maternal rats 7 out of 13 had fibroadenomas of the mammary gland (6 cases), adenoma of the pituitary (2 cases), thymoma, reticulum cell sarcoma of the lung and leukemia. Evidence indicates that transplacental carcinogenesis may involve a tropic action unusual for the given blastomogenic substance at later stages of ontogenesis.

3695 TOXIC EFFECT OF 7,12-DIMETHYL-BENZO(a)-ANTHRACENE ON NEOPLASTIC CELLS OF L STRAIN GROWN IN MIXED CULTURES WITH NORMAL CELLS.

(Rus.) Vasiliev, Iu. M. (Moscow U., Lab. Math. Methods Biol., USSR), L. A. Mittelman, Iu. Iu. Sharovskaia. *Tsitologiia* 15(1):67-73, 1973.

It was assumed that active metabolites of 7,12-dimethyl-benzo(a)anthracene (DMBA), benzo(a)pyrene, and other polycyclic hydrocarbons affect resistant tumor cells provided the latter are in contact with normal cells metabolizing the hydrocarbons added to the culture. Studies were made with two types of cultures: susceptible normal fibroblastic cells of murine embryos and resistant neoplastic fibroblasts of the L strain. DMBA substantially reduced the density of the labeled L cells and inhibited their passage into the S-phase of the mitotic cycle. DMBA affected the L cells on the surface of normal fibroblasts but had no effect on the cells growing on the clean slide in another part of the culture. It is suggested that the toxic effect is produced by a short-lived DMBA metabolite capable of affecting the L cells located nearby.

3696 TRANSPLACENTAL BLASTOMOGENIC ACTION OF 7,12-DIMETHYLBENZ(a)ANTHRACENE IN MICE.

(Rus.) Ivanov-Golitsyn, M. N. (N. N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR). *Vopr Onkol* 20(8):65-69, 1974.

Studies were made of the transplacental carcinogenic action of 7,12-dimethylbenz(*a*)anthracene (DMBA) in a single administration to pregnant mice whose progeny was fostered by lactating females unaffected by DMBA. An aqueous-lipid emulsion of DMBA was injected i.v. in 27 white mice (40 mg/kg) 18-20 days after conception. The fetuses were removed by cesarean section 6 hr after the injection and placed with intact lactating females. Cesarean offspring of 19 mice in-

ted with aqueous-lipid emulsion only served as
trols. One yr after the injection 52 surviving
trol mice and 72 surviving test mice were
led. The incidence of pulmonary, ovarian and
rine tumors in progeny of DMBA-treated females
2.7 times higher than in the controls (total,
lung tumors, 27; others, 14). The incidence of
monary adenomas in controls was 2.4 times lower,
h no evidence of malignant adenomas. The higher
idence of neoplasms in DMBA-injected progeny is
viously caused by carcinogen transport through the
acenta.

97 THE REPLICATION OF MOUSE SKIN EPIDERMAL DNA TO WHICH IS BOUND 7,12-DIMETHYLBENZ)ANTHRACENE.

(E.) Bowden, G. T. (Univ. Wisconsin
d. Sch., Madison) and R. K. Boutwell. *Chem Biol
teract* 9(1):15-23, 1974.

udies were carried out in female CD-1 mice to de-
rmine whether epidermal DNA to which 7,12-dimethyl-
nz(a)anthracene (DMBA) had been bound could
rve as template for further DNA synthesis. Mice
re treated topically with ^{3}H-labeled DMBA (10 µg)
llowed 6 hr later by topical 0.5% croton oil to
timulate DNA synthesis. After 24 hr, all mice re-
eived 16 serial i.p. injections of 0.5 mg 5-bromo-
eoxyuridine (BUdR) and 0.5 mg 5-fluorouracil every
.5 hr. Epidermal DNA was isolated and analyzed on
eutral CsCl gradients. ^{3}H-radioactivity was found
n both replicating and nonreplicating DNA fractions
nder these conditions. Further analysis of the in-
ividual DNA strands on alkaline CsCl gradients
howed that ^{3}H-DMBA was incorporated only into the
ight parental strands and not into the newly syn-
hesized heavy strands. Studies in which epidermal
NA prelabeled with BUdR was able to incorporate
H-DMBA into both light and heavy strands following
roton oil stimulation indicated that BUdR did not
nterfere with DMBA binding. The ability of DMBA-
ound DNA to serve as template for further DNA syn-
thesis was confirmed by experiments in which ^{3}H-
MBA bound only to the light strand when applied 24
r prior to BUdR labeling. These results support
the hypothesis that the genetic change necessary for
MBA carcinogenesis is introduced into newly synthesized daughter strand DNA upon replication of the
parental strand which is bound to DMBA.

3698 EFFECT OF EARLY INHIBITION OF DNA SYNTHESIS BY HYDROXYUREA ON 7,12-DIMETHYLBENZ(a)ANTHRACENE MAMMARY CARCINOGENESIS IN THE RAT.

(E.) Jabara, A. G. (Dep. Pathol., Univ. Melbourne, Australia), F. C. Wilson and R. J. Fisher. *J Pathol* 113(4):235-240, 1974.

The effect of continuous infusion of hydroxyurea (HU) on subsequent mammary tumor development was studied in 50 virgin female Sprague-Dawley rats fed 7,12-dimethylbenz(a)anthracene (DMBA) and injected s.c. for three consecutive days with progesterone (3 mg/day), starting at age 48 days. At 50 days of age infusion of HU was started (using polyethylene tubing placed into the peritoneal cavity). Rats in Group 1 (DMBA+P-2+NaCl) were continuously infused with 0.9% sterile saline and rats in Group 2 (DMBA+P-2+HU+NaCl) with HU (6.4 g/kg/hr); the infusions continued for 6, 12, or 24 hr after feeding DMBA. One hr after beginning the infusion, a single 30 mg dose of DMBA was fed by stomach tube to each rat. Survivors were killed 135 days after receiving DMBA, mammary tissue was biopsied, and autoradiographs of the mammary tissue were prepared; labeled cells were counted and the number referred to as labeled mammary epithelial nuclei (LEN). The infusion of HU depressed the LEN for that infusion time, but no correlation was demonstrated between the LEN number and subsequent tumor development. Constant infusion of HU almost totally inhibited DNA synthesis in mammary epithelial cells in DMBA+P-2 treated rats. It is concluded that the enhancing effect of progesterone on DMBA mammary carcinogensis is not mediated *via* stimulation of DNA synthesis in mammary epithelial cells.

3699 THE BINDING OF 7,12-DIMETHYLBENZ(a)ANTHRACENE TO REPLICATING AND NON-REPLICATING DNA IN MOUSE SKIN.

(E.) Bowden, G. T. (Univ. Wisconsin Med. Cent., Madison), B. G. Shapas and R. K. Boutwell. *Chem Biol Interact* 8(6):379-394, 1974.

In vivo binding of ^{3}H-dimethylbenz(a)anthracene (DMBA) to replicating and nonreplicating female CD-1 mouse epidermal DNA was studied. Animals received i.p. injections of 0.5 mg 5-bromodeoxyuridine (BUdR), 0.5 mg 5-fluorouracil, and ^{3}H-thymidine every 30 min for 7.5 hr starting at the same time as ^{3}H-DMBA (10 or 51.2 µg) was topically applied. Epidermal DNA synthesis was stimulated in some animals by prior topical application of 0.5% croton oil to the same site. Newly synthesized DNA was separated from nonreplicating DNA on CsCl density gradients. Under these conditions, both replicating and nonreplicating DNA incorporated DMBA. Binding to nonreplicating DNA from acetone pretreated controls was 5.76 ± 0.8 µM/mole DNA compared with 6.50 ± 0.12 µM/mole DNA for croton oil-pretreated mice. Replicating DNA from croton oil-pretreated mice bound less ^{3}H-DMBA, 4.68 ± 0.62 µM/mole DNA, representing a DNA binding ratio of replicating/nonreplicating epidermal DNA of 0.72 (51.2 µg DMBA). The binding ratio for croton-oil pretreated 10 µg DMBA-treated mice was 0.62. The decreased DMBA binding to replicating DNA was not due to interference by BUdR nor was it an artifact of the DNA extraction procedure. It is postulated that binding of DMBA to DNA could initiate post-replicative DNA repair resulting in an increased number of somatic cell mutations.

3700 PULMONARY ENERGY METABOLISM IN THE OFFSPRING OF MICE TREATED WITH A COMBINATION OF BENZO(a)PYRENE AND PHENOL.

(Rus.) Vysochina, I. V. (A. N. Sysin Inst. Gen. Communal Hyg., Moscow, USSR), I. N. Konstantinova, L. F. Astakhova and N. N. Skvortsova. *Gig Sanit* (8):93-95, 1974.

The separate and combined effects of benzo(a)pyrene (BP) and phenol on pulmonary energy meatbolism were studied in 120 offspring of rats exposed for 3 months to 5 mg of BP/month and phenol (0.4 mg/m^3 round the clock). The 3-month-old offspring were divided into

4 groups following the pattern of maternal exposure: (1) BP, (2) phenol, (3) BP and phenol and (4) control. Phenol, and particularly BP and phenol, reduced fructose 1,6-diphosphate and increased lactic acid contents in the lungs. In groups (1) and (4) the lactic acid content in the lungs remained the same. However, the incubation of the lung tissue in a medium containing nicotinamide-adenine dinucleotide and ATP increased the lactic acid content in the presence of BP. There was a significant reduction of the adenine nucleotide content in the lungs of all experimental animals due primarily to a decrease in the ATP content. The separate and combined action of BP and phenol induced greater changes in pulmonary energy metabolism in the offspring than in the mothers. It is suggested that phenol pollution of the air may stimulate the action of carcinogens, resulting in a higher incidence of lung cancer.

3701 LUNG TUMOR INDUCTION BY DIBENZ(*a,i*)PYRENE IN THE SYRIAN GOLDEN HAMSTER.

(E.) Stenback, F. (Univ. Nebraska Med. Cent., Omaha) and A. Sellakumar. *Z Krebsforsch* 82(3):175-182, 1974.

The neoplastic process resulting from repeated intratracheal instillations of dibenz(*a,i*)pyrene (DBP), a known constituent of cigarette smoke, in the respiratory system of Syrian golden hamsters is described. Respiratory tumor incidence was high, 75% at a 1 mg dose level and 65% at the 0.5 mg dose level. DBP was given intratracheally at the rate of 1 mg/week for 12 weeks or 0.5 mg/week for 17 weeks. The latent period was short, with the earliest tumors appearing in the larynx and trachea at 8 weeks after treatments. Tumors occurred in all parts of the respiratory system with the most frequent site of occurrence being the main bronchi, and squamous cell carcinomas being the most common type. Thus DBP was a potent carcinogen for the hamster respiratory system and it may be used in model experiments of tumor progression in the respiratory system.

3702 METABOLIC ACTIVATION OF BENZO(a)PYRENE PROCEEDS BY A DIOL-EPOXIDE.

(E.) Sims, P. (Chester Beatty Res. Inst., London, England), P. L. Grover, A. Swaisland, K. Pal and A. Hewer. *Nature* 252(5481):326-327, 1974.

The formation of 7,8-dihydro-7,8-dihydroxybenzo(a)pyrene-9,10-oxide from the metabolic activation of benzo(a)pyrene, and the ability of this diol-epoxide to react with DNA was studied. Primary cultures of Syrian hamster embryo cells and rat-liver homogenates were treated with benzo(a)pyrene labeled with either ^{3}H or ^{14}C. DNA hydrolysates from benzo(a)pyrene-treated cells were chromatographed on Sephadex columns. Results showed that benzo(a)pyrene underwent a two-stage metabolic activation that initially involved the formation of 7,8-dihydrodiol. This was further metabolized on the isolated 9,10-double-bond by the microsomal mono-oxygenase to give 7,8-dihydro-7,8-dihydroxybenzo(a)pyrene-9,10-oxide. This diol-epoxide reacted with DNA of benzo(a)pyrene-treated cells to yield hydrocarbon-deoxyribonucleoside products. These epoxide forms may be responsible for the carcinogenicity of benzo(a)pyrene.

3703 EFFECT OF THE ORGANOPHOSPHATE INSECTICIDE PARATHION AND ITS ACTIVE METABOLITE PARAOXON ON THE METABOLISM OF BENZO(*a*)PYRENE IN THE RAT.

(E.) Weber, R. P. (Thomas Jefferson U., Phila., Pa.) J. M. Coon and A. J. Triolo. *Cancer Res* 34(5):947-952, 1974.

The effects of parathion on the metabolism of benzo(*a*)pyrene (BP) and on biliary excretion of BP metabolites were studied *in vivo* in male Sprague-Dawley rats. When rats were pretreated with parathion (0.7 mg/kg/day, i.p.) or its active metabolite, paraoxon (0.3 mg/kg/day, i.p.) for 5 days prior to the i.v. administration of ^{14}C-BP (2.5 mg/kg), the excretion of radioactive material in the bile was markedly reduced compared to control values. The decrease in bile radioactivity caused by the insecticides was significant during the interval from 45-90 min after BP injection. The decrease was due to altered BP metabolism, not a decrease in bile flow. Determination of various tissue concentrations of ^{14}C-BP and ^{14}C-labeled BP metabolites 95 min after ^{14}C-BP administration i.v. showed that unchanged ^{14}C-BP was increased and that ^{14}C-BP metabolites were decreased in liver and small intestine but not in lung. *In vitro* studies of the hydroxylation of BP showed a decreased activity of BP hydroxylase in liver, small intestine, and lung of parathion- and paraoxon-pretreated rats. Addition of parathion and paraoxon (10^{-6} to 10^{-4} M) directly to incubation medium containing homogenates of liver, small intestine, and lung also inhibited BP hydroxylase.

3704 HIGH-PRESSURE LIQUID CHROMATOGRAPHIC ANALYSIS OF BENZO(*a*)PYRENE METABOLISM AND COVALENT BINDING AND THE MECHANISM OF ACTION OF 7,8-BENZOFLAVONE AND 1,2-EPOXY-3,3,3-TRICHLOROPROPANE.

(E.) Selkirk, J. J. (Natl. Cancer Inst., Bethesda, Md.), R. G. Croy, P. P. Roller and H. V. Gelboin. *Cancer Res* 34(12):3473-3480, 1974.

High-pressure liquid chromatography (HPLC) rapidly and efficiently separated three dihydrodiol (9,10-, 7,8-, and 4,5-dihydrodihydroxybenzo(*a*)pyrene), three quinone (benzo(*a*)pyrene-1,6-dione, -3,6-dione, and -6,12-dione), and two phenol (9- and 3-hydroxybenzo(*a*)pyrene) metabolites from the parent hydrocarbon. This method was used to study the mechanism of inhibition on the microsomal metabolism of benzo(*a*)pyrene (BP) by male Sprague-Dawley rats. The results obtained with HPLC were in general agreement with those obtained with thin-layer chromatography, although the ratio of diols to phenols was somewhat greater with HPLC. While the overall metabolism of BP is dependent on the amount of inducible enzyme present, the relative yield of each metabolite is reproducible to within 10-15%. 7,8-Benzoflavone (7,8-BF), an inhibitor of aryl hydrocarbon hydroxylase, inhibited the covalent binding of BP to DNA and inhibited formation of each of the metabolites. The lack of selective inhibition suggests that 7,8-BF acts on the oxidase or a prior component of the microsomal electron chain. 1,2-Epoxy-3,3,3-trichloropropane inhibited the disappearance of BP, which also suggests an inhibitory effect on oxidase activity. This compound, however, also stimulated the formation of BP binding to DNA, reduced the ratio

3-hydroxybenzo(*a*)pyrene to 9-hydroxybenzo(*a*)py-
e formation, and completely eliminated the forma-
n of the three dihydrodiols. This selective ef-
t suggests a specific inhibition of hydrase acti-
y with a lesser effect on oxidase function.

5 AUTORADIOGRAPHIC STUDIES OF EXPERIMENTALLY INDUCED ATYPIAS IN CERVICAL EPITHELIUM OF
E. *(E.)* Rubio, C. A. (Karolinska Inst., Stock-
m, Sweden) and B. Lagerlof. *Acta Pathol Microbiol*
nd [*A*] 82(4):475-482, 1974.

pattern of uptake of ^{3}H-thymidine into cervical
thelial tissue of C57Bl mice which received twice
kly topical cervical applications of 3,4-benzpy-
e (BP, 1% in acetone, 1-5 months) was studied by
oradiography. Nuclear labeling occurred in the
a-basal layer of cervical cells in all BP-treated
ups, ranging from a mean of 14% of cells in mice
hout cellular atypias to 37-38% of cells in ani-
s with grade II-III cellular atypia. No labeling
curred in the intermediate or superficial cervical
yers of control mice or in the superficial layer
BP-treated mice with grade I atypia. In general,
e extent of nuclear labeling was directly related
the degree of cellular atypia present. Mice with
ade II or III atypias showed labeling of 13% and
%, resp., of the cells of the intermediate layer
d 21% and 28%, resp., of the cells of the super-
cial layer. Areas which showed epithelial budding
d significantly more labeling (P < 0.01) than did
eas without epithelial buds. Labeling of cells in
ese two layers was not greatly influenced by the
ase of the estrous cycle. Of 7 animals which were
phorectomized prior to BP treatment, none developed
ade II or III cervical atypias. Nuclear labeling
s present in the parabasal layer of all of these
ce, in the intermediate layer of two of the four
ce with grade I atypias, and in no superficial cells
any animal. No labeling was seen in the superfi-
al cervical layer of acetone-treated controls.

06 EFFECTS OF ESOPHAGEAL CONSTRICTION ON BENZO(a)PYRENE CARCINOGENESIS IN
MSTER ESOPHAGUS AND FORESTOMACH. *(E.)* Dunham,
J. (Natl. Cancer Inst., Bethesda, Md.) and R. H.
eets. *J Natl Cancer Inst* 53(3):875-881, 1974.

constrict the lumen of the hamster esophagus,
lyethylene cuffs were surgically implanted around
e esophagus just above its junction with the fore-
omach. This procedure resulted in atrophy of the
ithelium at the level of the cuff and proximal
ilatation of the esophagus with hypertrophy of the
uscle. Benzo[a]pyrene (BP) in dimethyl sulfoxide
DMSO) vehicle was instilled twice weekly for 5
k in the esophagus of hamsters with and without
he constricting cuffs. Eventually, papillomatous
esions and atypias developed in the esophagus and
apillomas in the forestomach of some of the ham-
ters that survived to ages over 9 months. Although
esions developed in the esophagus and forestomach
n hamsters in both groups treated with BP, there
ere differences in the types of lesions and in
urvival times. In the esophagus, a papillary
arcinoma, papillomatosis, and an area of cellular atypia developed in 3 of 8 hamsters with constricted esophagus; a papilloma and 5 instances of cell atypia developed in 6 of 18 hamsters with non-constricted esophagus. The ages of hamsters with esophageal lesions in the constricted group averaged 4.5 months less than in the non-constricted group. In the forestomach, there were fewer papilloma-affected hamsters in the constricted group, even though these hamsters were 4 months older than those with gastric papillomas in the nonconstricted group. Gastric papillomas that had progressed to carcinoma were found only in hamsters without constriction of the esophagus.

3707 PASSAGE OF BENZO(a)PYRENE THROUGH THE PLACENTA IN MICE.
(Rus.) Shendrikova, I. A. (N. N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR), M. N. Ivanov-Golitsyn and A. Ia. Likhachev. *Vopr Onkol* 20(7):53-56, 1974.

The time-course of transplacental permeability of benzo(a)pyrene (BP) was studied in white mice injected i.v. with aqueous-lipid BP emulsion on the 17-19th day of pregnancy. Five min after the injection BP reached the embryonal tissues with the maximum concentration (1900 μg/g) recorded 15 min after the injection. BP content in the embryo was 40-50 times lower than in the maternal liver. Two hr after the injection BP concentration in the embryo was 0.330 μg/g or 17% of the maximum value, in maternal liver it was 0.55 μg/g (1%). In 6 hr only traces of BP were found. A comparison with 7,12-dimethylbenz(*a*)anthracene (DMBA, 20 μg/g) showed that its maximum concentration was 10 times lower. The tumorigenic action of DMBA was 3-4 times greater than that of BP which is known to stimulate the enzyme systems that are likely to diminish the blastomogenic effect of the carcinogen in continuous administration.

3708 FURTHER STUDIES ON THE EFFECT OF A TRANSPLANTED METHYLCHOLANTHRENE-INDUCED FIBROSARCOMA ON HUMORAL IMMUNITY IN CBA MICE.
(E.) James, K. (Univ. Edinburgh Med. Sch., Scotland), I. Milne and G. Warr. *Clin Exp Immunol* 18(2):243-250, 1974.

The effect of alum bovine serum albumin (BSA) on the immunodepressive effect of transplanted methylcholanthrene-induced fibrosarcoma was studied in inbred male CBA mice. Simultaneous implantation of 10^5 viable tumor cells and injection of 1 mg alum BSA produced no change in humoral response as determined by circulating antibody titer after 21 days. However, when alum BSA injection was delayed for 3-13 days, humoral responses were significantly depressed on 5 of 7 occasions. Spleen cells from animals showing depressed humoral responses to alum BSA were just as effective as normal spleen cells in restoring immune response following injection into x-irradiated syngeneic hosts. Simultaneous tumor and alum BS injection caused significant reduction in the IgG1 splenic plaque forming cell response to sheep RBC: however, injection of alum BSA into mice with established tumors revealed elevated IgM and IgG2b responses. Studies in which selective IgM and IgG plaque-forming cell response was assessed following sheep RBC challenge showed no evidence that simultaneously transplanted or established tumor caused depression in the response of draining lymph nodes.

3709 CHARACTERIZATION OF SPONTANEOUS AND INDUCED EPITHELIAL AND MESENCHYMAL TUMOURS BY THEIR ENZYME PATTERNS. *(E.)* Wilson, P. (Imp. Cancer Res. Fund, London, England). *J Pathol* 113(3): 151-159, 1974.

The enzyme patterns of several spontaneously *in vitro* transformed tumor cell lines of mesenchymal and epithelial origin were compared with those of some *in vivo* spontaneous and methylcholanthrene-induced mouse tumors. Enzyme activities were determined by biochemical assay of cell homogenates and by light and electron microscope histochemistry. Activity of most enzymes (succinic dehydrogenase, cytochrome oxidase, NAD diaphorase, alkaline phosphatase, ATPase and 5'-nucleotidase) showed considerable variation both within a group of tumors and between different tumor types. Tumors of mesenchymal origin characteristically had low levels of surface transport enzymes (alkaline phosphatase and/or 5'-nucleotidase) and high levels of NAD diaphorase. Epithelially derived tumors had low mitochondrial succinic dehydrogenase but high lysosomal β-glucuronidase activity. Electron microscopy revealed nonspecific lead deposits on mitochondrial membranes of mesenchymal but not epithelial tumor cells. The involvement of surface enzymes in carcinogenesis was suggested by the lack of alkaline phosphatase in 14 tumors of *in vitro* origin as well as in spontaneous uterine and methylcholanthrene-induced sarcomas. In tumors where alkaline phosphatase was not decreased, activity of one of the other surface enzymes was diminished. Acid phosphatase showed an unusual distribution in 6 tumors of *in vitro* origin, being found on the external cell membrane.

3710 ERRONEOUS BASE-PAIRING INDUCED BY A CHEMICAL CARCINOGEN DURING DNA SYNTHESIS. *(E.)* Sirover, M. A. (Fox Chase Inst. Cancer Res., Philadelphia, Pa.) and L. A. Loeb. *Nature* 252(5482): 414-416, 1974.

The modification of a synthetic polynucleotide template with the carcinogen β-propiolactone and the resultant increase in the incorporation of noncomplementary base-paired nucleotides into DNA with the DNA polymerase from avian myeloblastosis virus (AMV) or sea urchin embryos was studied. β-Propiolactone (0-85 μM final concentration) was incubated with 200 μg of poly(dA)$_{\overline{2000}}$·oligo(dT)$_{12-18}$. Synthesis was measured by the simultaneous incorporation of the complementary and noncomplementary nucleotides. The number of noncomplementary nucleotides incorporated increased progressively as template modification (by β-propiolactone) was increased (the error rate increased from 1/579 to 1/203 with AMV DNA polymerase, from 1/3852 to 1/1626 with sea urchin DNA polymerase). The incorporation of noncomplementary nucleotides was totally dependent on Mg^{++}, correct nucleotide (dTTP), enzyme, and template. These errors were evenly distributed during synthesis. By using ^{3}H and ^{32}P it was shown that the noncomplementary nucleotide was present in the phosphodiester linkage. These results show a possible relationship between a chemical carcinogen and errors in DNA replication. The accuracy with which a polynucleotide template was copied by AMV DNA polymerase and by sea urchin DNA was decreased as a result of modification of the template by the carcinogen.

3711 BEHAVIOUR OF ADENYL CYCLASE IN MAMMARY GLAND OF MICE SUBSCEPTIBLE (sic) AND RESISTANT TO BREAST CANCER. *(E.)* Sheth, N. A. (Cancer Res. Inst., Bombay, India), S. V. Bhide, and K. J. Ranadive. *Indian J Cancer* 11(2):177-182, 1974.

Studies were conducted on the effects of s.c. estrogen (2 μg/0.2 ml olive oil/day) and progesterone (1 mg/0.2 ml olive oil/day) on adenyl cyclase activity in breast tissue of female C57 (Jax) and C57 (Black) mice, which are, resp., susceptible and resistant to breast cancer. Enzyme activity was also studied in breast tissue of C3H (Jax) mice under various physiological conditions, in mammary tumors, and in primary hepatomas and primary lung adenomas of male Swiss mice. Estrogen treatment, pregnancy, and lactation significantly increased adenyl cyclase activity in breast tissue of C3H (Jax) mice. Neither estrogen nor progesterone treatment stimulated the enzyme activity in the breast tissue of C57 (Black) mice. However, the resistant mice have an initially higher metabolic activity which may play a role in their resistance to development of breast cancer. Adenyl cyclase activity was higher in mammary tumors than in normal breast tissue but was much lower in tumors than in hyperplastic nodules. The enzyme activity in liver tumor did not vary from that in normal liver tissue, whereas no activity was detected in lung tumor. This indicates that adenyl cyclase activity is not essentially linked with these malignancies. However, both female sex hormones and hormonal status of the animal affect the enzyme activity in mammary tissue of susceptible C3H (Jax) mice.

3712 PROTECTIVE EFFECT OF BENZOFLAVONE AND ESTROGEN AGAINST 7,12-DIMETHYLBENZ(A)ANTHRACENE- AND AFLATOXIN-INDUCED CYTOTOXICITY IN CULTURED LIVER CELLS. *(E.)* Schwartz, A. G. (Temple U. Med. Sch., Philadelphia, Pa.). *Cancer Res* 34(1):10-15, 1974.

Cultured liver epithelial cells (E-3) established from an adult male Sprague-Dawley rat were incubated in media containing 7,12-dimethylbenz(a)anthracene (DMBA) with or without 7,8-benzoflavone or a steroid. After 24 hr in these media and 24 hr in normal medium, ^{3}H-thymidine was added to the cultures. 7,8-Benzoflavone exerted a protective effect on the DMBA-induced inhibition of acid-insoluble ^{3}H-thymidine incorporation by the liver cells; the protective effect was dependent on the concentration of 7,8-benzoflavone. 7,8-Benzoflavone also exerted a protective effect against the depression in acid-insoluble ^{3}H-thymidine incorporation produced by treatment of the E-3 cells with either aflatoxin B$_1$ or sterigmatocystin. Estrogenic steroids, which

previously been shown to protect against the
toxic effect of DMBA, also protected against
cytotoxic effect of aflatoxin B_1. These obser-
ions may be related to the high incidence of
nary liver cancer in areas of Africa and Southeast
a and to the increase in cancer incidence with
. The decline in plasma estrogen levels in
en with age may be involved in cancer development.

3 SEX CHROMATIN IN THE UTERINE AND VAGINAL
EPITHELIUM IN RATS WHEN ESTROGEN LEVELS
ELEVATED. *(Rus.)* Mudra, N. P. (Lvov Sci. Res.
t. Pediatr., Obstet. Gynecol., USSR). *Akush*
ekol (8):23-26, 1974.

percentage of nuclei containing sex chromatin
determined in the uterine and vaginal epithelium
62 sexually mature albino rats which were divided
o three groups. These consisted of (1) 21 un-
ated controls sacrificed at different periods in
estrous cycle; (2) 21 rats injected i.m. with 10
estradiol diproprionate (EDP) every two days for
ur wk (clinical dose); and (3) 20 rats injected
. with 50 µg EDP every two days for four wk (five
es the clinical dose). Controls were sacrificed
er an observation period of 20-30 days, while rats
groups (2) and (3) were sacrificed either two days
one month after the last injection of EDP. Among
controls, 47.7 ± 1.67% of nuclei in the vaginal
ithelium and 48.0 ± 2.95% in the uterine epithelium
ntained sex chromatin. The number of nuclei con-
ining sex chromatin remained the same in all stages
the estrous cycle, i.e. during physiological fluc-
ations in the activity of estrogen. Administration
both doses of EDP was accompanied by proliferation
the multilayered squamous epithelium and a signi-
cant decrease in the number of nuclei containing
x chromatin. All rats given the larger dose of
P and only nine of those given the smaller dose
veloped vaginal keratinization. In rats given the
rger dose of EDP, epithelial proliferation was
companied by dystrophic and necrotic changes, and
e decrease in the percentage of nuclei containing
x chromatin remained significant one month after
scontinuation of EDP. This decrease in the per-
ntage of nuclei containing sex chromatin might be
manifestation of a disorder in gene regulation of
llular metabolism.

14 THE INFLUENCE OF ANDROGEN ON THE DEVELOP-
MENT OF EXPERIMENTAL BONE TUMORS. *(Rus.)*
rnitskii, M. A. (Orenburg Med. Inst., USSR). *Vopr*
kol 20(11):26-31, 1974.

udies were carried out on the effect of testoster-
e-propionate on bone sarcomas induced by 9,10-
methyl-1,2-benzanthracene (DMBA) in 63 male rabbits
vided into a control group (31 animals) in which a
mg DMBA pill was implanted in the metaphysis of
e tibia and an experimental group (32 animals) in
ich, after the DMBA implantation, a 5% solution of
sterone propionate in oil was injected (0.2 ml/kg;
ice a week during the entire experiment). In the
ntrol group, presarcomatous changes were found in
animals (average time 222 days) as focal prolifer-
tes of anaplastic fibroblasts, polymorphous cells
and osteoblasts. Intramedullary sarcomas were found in 6 animals (average 314 days), large osteogenic sarcomas in 5 animals (356 days). In the experimental group, presarcomatous foci were found in 5 animals (93 days) both in the capsule region and outside. In 2 animals, presarcomatous foci developed in the epiphyseal plate region; in one animal in the endosteum. Intramedullary and osteogenic sarcomas were found in 9 animals (194 days) and 4 animals (270 days), resp. The findings indicate that testosterone-propionate resulted in osteogenetic disorders involving a faster resorption of the epiphyseal plate. The experimental rabbits developed presarcomatous changes 129 days earlier, and sarcomas 120 days earlier than the controls. The time difference in blastogenesis is explained by a higher susceptibility of the epiphyseal plate to the DMBA action during osteogenesis induced by a higher androgen level in the treated rabbits. It is suggested that hormonal maladjustment involving hyperandrogenesis might be one of the causes of more frequent osteogenic sarcomas in male teenagers during puberty.

3715 SIDEROSILICOSIS AND ATYPICAL EPITHELIAL HYPERPLASIA. *(E.)* Levy, S. A. (St. Luke's Hosp., Milwaukee, Wis.) and I. Margolis. *J Occup Med* 16(12):796-799, 1974.

A clinical report on a 34-yr-old male oxyacetylene torch cutter (exposed to high levels of iron oxide and silica) with siderosilicosis of the lung, diffuse interstitial fibrosis, and highly atypical alveolar epithelium is presented. Clinical signs included dyspnea and a cough with occasional production of yellow sputum. Roentgenograms of the chest revealed a fine reticular pattern, and pulmonary function studies revealed a combined ventilatory impairment with features of obstruction and restriction accompanied by arterial hypoxemia and compensated respiratory alkalosis. Lung biopsy revealed thickening of the alveolar septa by fibrous tissue, numerous birefringent particles (shown to be iron oxide and silica), alveolar lumens filled with pigment laden macrophages, and nodules of atypical epithelial proliferation in association with "honeycombing" and desmoplasia of the stroma. Previous observations clearly indicate an association between pulmonary neoplasms (especially undifferentiated epidermoid or adenocarcinomas) and the atypical epithelial proliferation and diffuse interstitial pulmonary fibrosis seen in this case.

3716 CARCINOGENIC POTENTIAL OF MAGNESIUM DEFICIENCY. *(E.)* Mease, A. D. (Fitzsimmons Army Med. Cent., Denver, Colo.). *Lancet* (7780):590, 1974.

The controversy regarding the effect of hypomagnesemia on cancer growth and development is reviewed. Data are reported which suggest impairment of lymphocyte transformation in magnesium-deficient Sprague-Dawley rats secondary to either a primary effect on the lymphocyte or inhibition of the lymphocyte by serum factors. This suggests that the magnesium-deficient rat has impaired cellular immunity. The impaired lymphocytic function may explain the increased incidence of certain malignancies in magnesium-deficient rats.

3717 NITROSAMINE SYNTHESIS IN THE REACTION OF MONOSACCHARIDES WITH AMINO ACIDS (MAILLARD REACTION) IN THE PRESENCE OF SODIUM NITRITE. (REPORT 2).

(Ger.) Heyns, K. (Inst. Organic Chem. Biochem., U. Hamburg, Germany), H. Roper and H. Koch. *Z Lebensmittel Untersuch Forsch* 154(4):193-200, 1974.

The Maillard reaction, which occurs in many processes involved in food preparation and food technology, was performed by dissolving mixtures of D-glucose/DL-alanine, D-glucose/L-lysine, or D-glucose/L-glutamic acid (molar ratio of glucose/amino acid of 1:2) in water, adjusting the pH to values between 3.0 and 4.0, mixing with potato starch and freeze-drying the resulting suspension. The finely ground powder was mixed with finely ground sodium nitrite and browned at 100-150 C for 24 hr. Analysis of the volatile, alkali-stable reaction products by gas chromatography or a combination of gas chromatography and mass spectrometry showed no evidence of dimethyl-, diethyl-, di-*n*-propyl-, or di-*n*-butylnitrosamine. Similar results were obtained by adding sodium nitrite after browning. The only nitrosamine identified by mass spectrometry was nitrosopiperidine which was formed when D-glucose was reacted with L-lysine at pH 3.0 and 150 C and sodium nitrite was added after browning. Nitrosopiperidine has produced esophageal and hepatic carcinomas in chronic animal experiments. Since all foods contain small amounts of free amino acids, foods subjected to browning in the presence of sodium nitrite should be tested for the presence of carcinogenic nitrosamines.

3718 NUCLEAR PROTEIN CHANGES DURING THE NITROSAMINE-INDUCED CARCINOGENESIS OF RAT LIVER.

(E.) Gronow, M. (Dep. Exp. Pathol., Univ. Leeds, England) and T. M. Thackrah. *Chem Biol Interact* 9(3):225-236, 1974.

The thiol components of [2,3-^{14}C]-*N*-ethyl maleimide proteins of male Wistar rat liver were studied by sodium dodecyl sulfate (SDS) electrophoresis and isoelectric focusing in polyacrylamide gels during feeding of a diet containing diethylnitrosamine (DEN) (3 mg/kg/day in drinking water). The nonhistone proteins isolated from rats with 8 M urea at different times 30-110 days after initiation of DEN feeding were the same as those from controls. After 80 days of DEN feeding, consistent decreases in ^{14}C-labeled, and hence, thiol-containing proteins focusing at a pI of 6.80 and in the region of pI 5.40-5.90 were noted. Although the Coomassie blue staining patterns on SDS gels were identical between control and DEN-treated samples, the ^{14}C-labeling pattern showed lower specific activity of the lower molecular wt components from DEN-treated liver. After 80 days, no difference was seen in the rate of incorporation of ^{14}C-amino acids into overall nonhistone liver proteins of control and DEN-treated rats; however, histone F3 specific activity was about 50% of control. When nonhistone proteins of hepatoma 223 ascites tumor cell nuclei were studied, distinctly different dye binding patterns and ^{14}C-labeled thiol component distributions were observed on SDS gels and isoelectric focusing compared with controls. These, like DEN-treated liver, showed a high concentration of proteins focusing in the pI 5-6 region; however, markedly different patterns in thiol containing proteins of molecular wt 36-72 kilodaltons were seen.

3719 RAPID AND SELECTIVE INDUCTION OF URINARY BLADDER CANCER IN RATS WITH N-ETHYL-N-(4-HYDROXYBUTYL)NITROSOAMINE AND BY ITS PRINCIPAL URINARY METABOLITE.

(E.) Hashimoto, Y. (Tokyo Biochem. Res. Inst., Japan), M. Iiyoshi and M. Okada. *Gann* 65(6):565-566, 1974.

The incidence of urinary bladder cancer in male ACI/N rats given N-ethyl-N-(4-hydroxybutyl)nitrosoamine (EHBN, 0.042%) and its principal urinary metabolite, N-ethyl-N-(3-carboxypropyl)nitrosoamine (ECPN, 0.046%), in drinking water was compared with the incidence of bladder cancer in rats given N-butyl-N-(4-hydroxybutyl)nitrosoamine (BBN, 0.050%). Beginning at age 10 wk, the rats received the compounds in their drinking water continuously for 20 wk in the daily dose of 20 ml/animal. After 20 weeks all 19 rats receiving EHBN and all 9 rats receiving ECPN developed large transitional cell carcinomas in the bladders. In contrast 2 of 3 rats which received BBN developed only small papillomas in the bladder after 20 wk; while all 7 rats which received BBN for 20 wk and then t water for 10 more wk developed tumors, only 2 of these tumors were cancerous, the rest being papillomas. It is evident that EHBN is a more effective bladder carcinogen in the rat than BBN, and that ECPN is as effective as EHBN. Thus ECPN may be responsible for the organotropic carcinogenicity of EHBN to the urinary bladder.

3720 STROMAL NEPHROMAS AND RENAL CELL TUMORS IN SUCKLING AND WEANED RATS.

(E.) Campbell, J. S. (Res. Lab. Hlth. Protection Branch, Dept. Natl. Hlth. Welfare, Ottawa, Canada), G. S. Wiberg, H. C. Grice and P. Lou. *Cancer Res* 34(9): 2399-2404, 1974.

Renal neoplasms with induction times ranging from 218-505 days appeared in 51 (64%) of 80 male Wistar rats in 3 groups which, when 1 or 7 days old, were given single s.c. injections of dimethylnitrosamine in dosages of 125 μg/animal or 10 mg/kg. In 44 male rats so treated after weaning at 21 or 70 days of age, tumor yields were scant and induction times exceeded 480 days, but dimethylnitrosamine dosage levels of 20 or 30 mg/kg produced renal tumors with induction times ranging from 286-550 days in 33 (53%) of 62 males in 4 groups also treated at 21 or 70 days of age. The hepatoma yield was small. Abdominal palpation was highly accurate for relatively early diagnosis of renal neoplasms. Ninety-two percent of the renal neoplasms in rats treated when sucklings were stromal nephromas; 41% of the renal tumors in rats treated after weaning were of the renal cell type. One stromal nephroma produced epithelial-containing pulmonary metastases.

THE NATURE OF DIMETHYLNITROSAMINE INDUCED ENLARGEMENT OF RAT HEPATOCYTE NUCLEI.

Jackson, M. R. (Royal Sch. Vet. Studies,
burgh Univ., Scotland). *J Pathol* 113(3):197-
1974.

tocyte DNA content, DNA synthesis, binucleate
ers, and mitotic activity following treatment
dimethylnitrosamine (DMN) were studied in 2-
old Ash-Wistar rats. An i.p. injection of DMN
mg/kg) was given at age 2 days; controls re-
ed 20 µl saline/rat. In the DMN-treated rats,
e was a rapid increase in the numbers of tetra-
d nuclei, reaching a maximum by day 4, and de-
ing from 35% to 22% by day 21. Following DMN
nistration, the mitotic activity of the paren-
al cells was profoundly depressed for 2 days but
rned to control levels by the third day. There
an initial inhibition of DNA synthesis (as
ged by the incorporation of ^{3}H-thymidine) of
atocytes 7 hr after DMN administration, but by
r there was a marked increase in DNA synthesis
this persisted for 24 hr longer. The level re-
ed to control levels by the third day. The rate
development of binucleate cells in the treated
ups approximated that of the control group, which
e sharply by the 14th day. DMN resulted in an
egularly distributed centrilobular necrosis of
atocytes and a generalized necrosis of hepatic
atopoietic tissue. DMN was shown to increase
lear ploidy in the liver by bringing about a
ck in the G_2 stage of the cell cycle. This anti-
otic effect persisted only for one cell cycle.

2 THE EFFECT OF N-NITROSO-N-METHYLUREA AND N-DIMETHYLNITROSAMINE ON CELL MEDIATED HUMORAL IMMUNE RESPONSES IN RATS AND MICE. *(E.)*

nforth, H. B. (Middlesex Hosp. Med. Sch., London,
land) and P. N. Magee. *Br J Cancer* 30(6):512-523,
4.

effect of N-nitroso-N-methylurea (NMU) and N-
ethylnitrosamine (DMN) on cell mediated and hu-
al immune responses were studied in adult male
tar rats and adult male (C57BL X BALB/c)F_1 mice
NMRI mice. Skin graft survival times were de-
mined in NMU- and DMN-treated animals. The number
direct plaque forming cells (PFC) in the spleen
determined by the method of Jerne, Nordin and
ry, and hemagglutinin titers and white blood cell
nts were done by standard methods. In the DMN
mg/kg)-treated rats, no leucopenia was seen
any time and skin graft survival was similar to
t of the controls (10.8 days compared with 11.3
s in the controls). Rats treated with a single
se of NMU (90 mg/kg) showed a significant drop in
ite blood cell count by 24 hr and a marked leu-
penia by the sixth day, but normal counts re-
rned by day 15. The survival time for the skin
afts was 12.8 days. Two doses of NMU produced a
rked and progressive leucopenia which was sus-
ined to day 15, and the mean survival time for
e grafts was 15.7 days. The response patterns
tween the rat and mouse experiments and between
e 2 strains of mice were very similar. NMU given to rats depressed the number of spleen PFC, while the DMN increased the number of PFC/spleen. NMU and an LD_{50} dose of DMN reduced the number of PFC in F_1 mice. In rats, only NMU significantly reduced the circulating hemagglutinin antibody titer. In mice, both NMU and DMN induced a fall in antibody titer. The increased skin graft survival time in both rats and mice treated with NMU showed some dose dependency and was related to the length of the immunodepressed state and possibly the degree of immunodepression as reflected by leucopenia. DMN produced neither extended graft survival time nor a leucopenia. NMU strongly reduced the humoral immune response in both species. DMN has been shown to lack immunosuppressive ability, thus indicating that immunosuppression is not a prerequisite for carcinogenicity.

3723 DIBENAMINE IMPAIRMENT OF RAT HEPATIC MICROSOMAL ENZYMES AND ITS RELATION TO HEPATOTOXICITY INDUCED BY CCl_4 AND DIMETHYLNITROSAMINE. *(E.)*

Stripp, B. (Natl. Heart Lung Inst., Bethesda, Md.), I. G. Sipes, H. M. Maling and J. R. Gillette. *Drug Metab Dispos* 2(5):464-468, 1974.

CCl_4 (2.0 ml/kg) and dimethylnitrosamine (DMN, 150 mg/kg) were administered i.p. to male Sprague-Dawley rats, which were killed 24 hr later. Dibenamine hydrochloride (25 mg/kg) was administered s.c. 48 and 24 hr before the hepatotoxic agents. Dibenamine treatment alone moderately impaired (44-26%) the N-demethylation of ethylmorphine (EM) and DMN in the the hepatic microsomes. Cytochrome P-450 concentration decreased 23-30% and the activity of cytochrome c reductase was unaffected. Dibenamine treatment also reduced the *in vitro* covalent binding of $^{14}CCl_4$ and ^{14}C-DMN to microsomal protein by 46 and 28%, respectively. The inhibition of N-demethylase activity apparently lasted throughout the period in which the animals were exposed to the hepatotoxic agent. The inhibition of EM N-demethylation was apparently not due to a change in the affinity of the enzyme for the substrate, but to quantitative changes in the enzyme. A concentration of 1 mM dibenamine was needed *in vitro* to reduce the V_{max} to the same extent as seen after *in vivo* treatment. Dibenamine pretreatment may protect rats from the hepatotoxicity of DMN and CCl_4 by reducing the formation of active metabolites by microsomal enzymes.

3724 DNA DAMAGE AND ITS REPAIR IN TRANSFORMABLE MOUSE FIBROBLASTS TREATED WITH *N*-METHYL-*N*'-NITRO-*N*-NITROSOGUANIDINE. *(E.)*

Peterson, A. R. (Wisconsin Med. Sch., Madison), J. S. Bertram and C. Heidelberger. *Cancer Res* 34(7):1592-1599, 1974.

The effects of *N*-methyl-*N*'-nitro-*N*-nitrosoguanidine (MNNG) on DNA damage and repair were studied in asynchronous cultures of C3H/10T1/2 mouse fibroblasts by sedimentation of mouse fibroblast DNA through alkaline sucrose gradients. Analysis of DNA from untreated cells prelabeled with ^{3}H-thymidine and ^{14}C-choline or ^{14}C-leucine showed that the band containing 70-90% of the total cellular DNA was free of lipids containing choline and proteins containing leucine, and did not aggregate with DNA from T_4 or T_7 bacteriophages. The patterns of degradation of both T_4 and T_7 bacteriophage DNA and of 10T1/2 DNA under alkaline conditions were similar, indicating that 10T1/2 DNA sedimented as single strands. Treatment of 10T1/2 cells with 0.5, 1.0, or 2.0 µg/ml MNNG for 2 hr resulted in a dose-dependent breakdown of cellular DNA, the repair of which was not complete 48 hr later. It was estimated that DNA from cells treated for 2 hr with 0.5 µg/ml MNNG contained at least 5.0 breaks/1.4 x 10^8 daltons.

3725 ON A POSSIBLE COCARCINOGENIC AND IMMUNOSUPPRESSIVE ACTIVITY OF PHORBOL IN AKR-MICE.

(E.) Gericke, D. (Dep. Exp. Histopathol., Univ. Vienna, Austria), W. Kovac and E. Hecker. *Z Krebsforsch* 82(3):183-189, 1974.

The effect of phorbol to activate a latent leukemia virus *in vivo* in female AKR mice, and the ability of phorbol to affect the cellular and humoral immune response of the mice was studied. The mice, which have a spontaneous rate of leukemia below 5%, were injected i.p. with solutions of phorbol in physiological saline twice a week for up to 30 weeks. A total dose of 24 mg phorbol/20 g of mouse was administered as a maximal dose. In the treated mice, the latent period of appearance of leukemia was not decreased nor was the rate of leukemia increased, as compared to the controls, who received saline injections only. Other pathological changes were not noticed with increased frequency in the treated mice. The cellular and humoral immune responses were not significantly affected by treatment as determined by the plaque test of Jerne and by hemagglutination tests. These results demonstrate that in the AKR strain of mice and in the doses given, phorbol did not exhibit leukemogenic or immunosuppressive activities.

3726 MITOGENIC ACTIVITY OF STERCULIC ACID, A CYCLOPROPENOID FATTY ACID.

(E.) Scarpelli, D. G. (Univ. Kansas Med. Cent., Kansas City). *Science* 185(4155):958-960, 1974.

The mitogenic activity of sterculic acid, a cyclopropenoid fatty acid in hepatocytes from fingerling trout and male Sprague-Dawley rats was studied. Cyclopropenoid fatty acids in *Sterculia foetida* oil at a dose level of 200 ppm, were fed to fingerling rainbow trout for four weeks, and 500 ppm of cyclopropenoid fatty acid was fed to rats for 2- and 4-week periods. The livers of all animals fed cyclopropenoid fatty acids were large and moderately fatty; liver weight, content of hepatic DNA, mitotic index, and incorporation of ^{3}H-thymidine into nuclear DNA of hepatocytes were increased significantly above those of control animals. Histologic and cytologic alterations (foamy cytoplasm with numerous fat droplets, large and hyperchromatic nuclei, enlarged and sometimes multiple nucleoli, and frequent mitosis) were evident after two weeks of cyclopropenoid fatty acid feeding and very similar in both species.

3727 INHIBITION OF *o*-AMINOAZOTOLUENE-INDUCED TUMORS WITH ANTIOXIDANTS.

(Rus.) Pliss, G. B. (N. N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR), F. K. Dzhioev and A. Ia. Broitman. *Vopr Onkol* 20(7):47-49, 1974.

In an attempt to inhibit the tumorigenic action of 10 mg pills of *o*-aminoazotoluene (O-AAT) implanted under the skin of 254 mature female C3HA and CC57Br mice 2-3 times at 30-45-day intervals, the animals were given N,N'-di-β-napthyl-*p*-phenylendiaamine (NPEA); 2,2'-thio-*bis*(4-methyl-6-*tert*-butylphenol) (TMBP); 2,2'-methylene-*bis*(4-methyl-6-*tert* -butylphenol); and 2,2'-thio-*bis*(4-methyl-6-α-phenylethylphenol). Antioxidants were suspended in 0.4 ml sunflower oil and administered two to three times/wk. The first three compounds were given in a dose of 11 mg p.o. through a stomach tube, while 20 mg of 2,2'-thio-*bis*(4-methyl-6α-phenyl-ethylphenol) were injected s.c. Treatment was begun two days before implantation of the first O-AAT pill and was discontinued one month after implantation of the last pill. The survivors were sacrificed after 12-16 months. In the two NEPA series, 53% and 25% of animals developed tumors (79% and 44.5% in the controls). The two other antioxidants had a far weaker inhibitory effect on tumor induction.

3728 THE EFFECT ON THE PROCESS OF CARCINOGENESIS OF CHANGES IN ANTIOXIDATIVE ACTIVITY OF LIPIDS IN THE PRESENCE OF ANTIOXIDANTS.

(Rus.) Burlakova, E. B. (Inst. Chem. Phys., Moscow, USSR) and E. M. Molochkina. *Vopr Onkol* 20(4):62-66, 1974.

The effects of two antioxidants, butylated hydroxytoluene (BHT) and 4-hydroxy-3,5-di*tert*butyl-α-methyl benzylamine (HBMB), on tumor development was studied in noninbred mice. Mice received a single s.c. injection of benzo(a)pyrene (3.8 mg dissolved in olive oil) followed, 25 days later, by seven doses of BHT (20 or 60 mg/kg) given at seven-day intervals. At this time lipid antioxidative activity in the liver had reached a minimum and had begun to increase. When 20 mg/kg BHT was administered, lipid antioxidative activity increased and the development of sarcomas was somewhat accelerated. Administration of 60 mg/kg BHT, however, reduced lipid antioxidative activity and inhibited sarcoma development. Sarcoma development was inhibited and lipid antioxidative activity in the liver was increased by administration of four doses of HBMB (40 mg/kg each) at seven- to eight-day intervals, starting seven days after benzo(a)pyrene injection. At this time lipid antioxidative activity was reduced in the liver. Thus, the effect of an antioxidant on tumor growth depends upon how it affects lipid antioxidative activity and upon whether this antioxidative activity is increased or decreased when the antioxidant is administered.

3729 CHEMOTHERAPEUTIC, CARCINOGENIC, AND CELL-REGULATORY EFFECTS OF TRIAZENES.

(E.) Schmid, F. A. (Mem. Sloan-Kettering Cancer Ctr., New York, N.Y.) and D. J. Hutchison. *Cancer Res* 34(7):1671-1675, 1974.

emotherapeutic, carcinogenic, and cell-regulatory fects of 1-phenyl-3-monomethyltriazine (PMT), 1-enyl-3,3-dimethyltriazene (PDT), and 5-(3,3-methyl-1-triazeno)imidazole-4-carboxamide (DIC) ve been determined. The maximum increase (%) in dian survival time of mice bearing the L1210 leuemia, after i.p. treatment with PMT, was 38 for a ngle dose and 50 for 6 daily injections. The efects of PDT and DIC were similar. PMT (45 mg/kg in esame oil) injected s.c. in 4 weekly doses caused eath due to local tumors in 9 of 11 AKR/J and in all C57BL/6J mice. Applied to the skin, PMT in C_6H_6 roduced papillomas in both strains to the same exent. Treatment of tumor-bearing mice for several ransfers with PMT (30 mg/kg in 6 daily i.p. doses) esulted in the decrease of oncogenic potential in he following neoplasms: L1210, P815, L5178Y, and 5178Y/CA55. Following exposure of L1210 cells to to 4 mM solutions of the triazenes at 3 C only PMT as cytocidal. These studies demonstrate carcinogenic, ytotoxic and cell-regulatory potential of the hree triazines.

3730 TUMOR ORGANOTROPY OF N-NITROSOMETHYLUREA UNDER THE INFLUENCE OF HORMONAL CONTRACEPTIVES. *(E.)* Thomas, C. (German Res. Soc., Bonn-Bad Godesberg, West Germany). *Recent Results Cancer Res* 44:170-173, 1974.

Following a review of the literature on oral contraceptives as tumor-inducing or potential carcinogenic agents, results are reported of animal experiments using nitrosomethylurea (NMU) and an aqueous suspension of 0.0075 mg mestranol and 0.25 mg lynestrenol (i.e. 1/10 of a tablet of 2.5 lynestrenol) per daily dose. Wistar rats were treated p.o. on three successive days with 40 mg NMU/kg/day. One experimental group received an aqueous suspension of 2.5 lynestrenol over a period of 30 days, prior to treatment with carcinogen; a second experimental group was treated with oral contraceptives over a period of 30 days, following carcinogen treatment. The results did not demonstrate any essential deviations in the organotropic effect of NMU as a result of prior or subsequent treatment with 2.5 lynestrenol. The only demonstrable difference was that rats pretreated with ovulatory inhibitors showed a significant decrease in total tumor yield, especially among nephroblastomas.

3731 INDUCTION OF LIVER CELL ADENOMATA IN THE RAT BY A SINGLE TREATMENT WITH N-METHYL-N-NITROSOUREA GIVEN AT VARIOUS TIMES AFTER PARTIAL HEPATECTOMY. *(E.)* Craddock, V. M. (Med. Res. Counc. Lab., Carshalton, England) and J. V. Frei. *Br. J Cancer* 30(6):503-511, 1974.

A study was undertaken to determine whether N-methyl-N-nitrosourea (NMU), which had not been reported to induce cancer in liver in adult animals, would induce liver cell cancer in 9-10 wk old female albino rats when given during the period of restorative hyperplasia following partial hepatectomy. Partial hepatectomies were carried out by the method of Higgins and Anderson. NMU (45-90 mg/kg) was given i.p. at 6 hr in the early prereplicative phase, at 24 hr, during the period of DNA synthesis, at 31 hr during mitosis when there was also DNA synthesis and sometimes at two of these times. Animals were kept until they died or until they appeared to be ill, when they were killed. The liver was weighed to determine whether regeneration had taken place and tissue was taken for histological examination. Liver cell adenomas were not present in rats treated in the early prereplicative stage, but were present in those treated at 24 or 31 hr. Although the lesions were not encapsulated, they met all the other criteria for liver cell adenoma; the majority were single nodules/animal; the cells were larger than those of the surrounding liver and sometimes vacuolated; and they contained liver cells only. In all instances the surrounding liver was free of cirrhosis and nodular hyperplasia. Although tumors were induced in other organs, their incidence did not correlate with the timing of NMU administration. It is suggested that replication of damaged DNA may be a relevant event in carcinogenesis.

3732 PREFERENTIAL INDUCTION OF CENTRAL OR PERIPHERAL NERVOUS SYSTEM TUMORS IN RATS BY NITROSOUREA DERIVATIVES. *(E.)* Cravioto, H. M. (New York Univ. Med. Cent., N.Y.), J. F. Weiss, H. H. Goebel, E. de C. Weiss and J. F. Ransohoff. *J Neuropathol Exp Neurol* 33(5):595-615, 1974.

The purpose of this study was to find a consistent and reliable method to induce central or peripheral nervous system tumors in various strains of rats using nitrosourea derivatives. CD-Fischer (CDF) and BD-IX inbred rats and randomly bred CFE (Sprague-Dawley derived) and Long-Evans (Blu:LE) rats were used. Pregnant rats of all strains received one single dose of 20 mg/kg of ethylnitrosourea (ENU) i.v. in one of the last 5 days of gestation; one-day-old LE rats received intracerebral injections of ENU (10 mg/kg); and 10-day-old BD-IX rats received a single p.o. dose of 10 mg/kg of ENU. Two-month-old BD-IX and CFE rats were given weekly i.p. injections of 5 mg/kg of methylnitrosourea (MNU). Another group of two-month-old CFE, CDF, and LE rats received monthly i.v. injections of 20 mg/kg of MNU. The rats were killed at the first clear evidence of neurological disorder or when they were very sick. Autopsies were done and tissue was prepared for electron microscopy. The dose of ENU given late in pregnancy induced neural tumors in 83-89% of the offspring, with the median tumor induction time being dependent on the strain and varying from 198-346 days. ENU given intracerebrally induced neural tumors in 91% of LE rats treated. Most of the tumors occurred at a site distant from the application of the chemical, and with either type of treatment half of the tumors appeared in the spinal cord, cerebellum, or peripheral nerves. I.v. MNU induced a much lower percentage of tumors of the peripheral nervous system and a higher percentage of tumors of the central nervous system in CFE, BD-IX and LE rats but not in CDF rats. The percentage of non-neural tumors was significantly higher in MNU than in ENU treated rats. The neuro-oncogenicity of ENU is best manifested in rats in which ENU is administered within the last 5 days of pregnancy. MNU is most effective in mature animals and requires multiple low doses. Thus ENU and MNU provide a model for the selective induction of nervous system tumors without direct manipulation of the neural tissues.

3733 INHIBITION OF URETHANE CARCINOGENESIS BY ANTIOXIDANTS AND CARBON TETRACHLORIDE.

(*Rus.*) Dzhioev, F. K. (N. N. Petrov Inst. Oncol., Leningrad, USSR) and R. M. Balanski. *Vopr Onkol* 20 (9):98-102, 1974.

Experiments on CC57 Br mice injected i.p. with 1 mg/kg of urethane showed that 1 mg/mouse diethylaminoethyl diphenylpropyl acetate (SKF-525A) injected i.p. 1 hr before urethane and 0.5 mg/mouse injected 4, 24, 48 and 72 hr afterward reduced the incidence of pulmonary adenomas by 28.7%, 25.8% and 37.9%. Administration of 11 mg of N,N'-di-β-napthyl-*p*-phenylenediamine p.o. in 0.4 ml sunflower oil 24 hr and 1 hr before urethane injection and 1, 2, 4 and 6 days afterward reduced the incidence of adenomas by 33% and 48%. Administration of 11 mg of 2,2'-methylene-*bis*(4-methyl-6-*tert*-butylphenol) in 0.4 ml of sunflower oil p.o. 24 hr and 1 hr before urethane and 1, 2, 4 and 6 days afterward had no significant effect on tumor induction, nor did 8 mg of α-tocopherol p.o. in 0.2 ml of sunflower oil 5 hr before urethane and 4 mg 4, 12, 36 and 72 hr afterward. Administration of 11 mg of 2,2'-thio-*bis*(4-methyl-6α-phenyl-ethyl phenol) p.o. in 0.4 ml of sunflower oil 24 hr and 1 hr before urethane and 1, 2, 4 and 6 days afterward increased the incidence of adenomas by 13% and 31%. Carbon tetrachloride (five 0.025 mg doses s.c. at 3-4-day intervals) injected prior to urethane reduced the incidence of adenomas by 32% and 47%.

3734 LUNG TUMORS DEVELOPING AFTER EXPOSURE TO URETHAN AND INFLUENZA VIRUS. *(Rus.)*

Botsman, N. E. (Kiev Res. Inst. Epidemiol. Microbiol. Parasitol., USSR) and A. F. Frolov. *Vrach Delo* (2):88-91, 1974.

Lung changes induced by the combined action of urethan and three strains of influenza virus (one A_2 and two B strains) were studied in 705 male and female albino mice. The test animals were 304 CC57 W mice with a high (24.5%) incidence of spontaneous lung tumors and 401 noninbred mice with a low (3%) incidence of such tumors. Of these mice, 292 received urethan (0.75 mg/g/wk s.c. for a total of 120 mg/g) followed by three intranasal doses of influenza virus administered at two wk intervals. Control groups received urethan alone (266 mice) or influenza virus alone (147 mice). Autopsies were performed on all mice which died; the rest were sacrificed after observation periods of one to 14 months or more. Precancerous changes included alveolar cell proliferation, in some cases accompanied by papillomatous epithelial growths or simple pulmonary lymphomas; focalized epithelial hyperplasia in the bronchi and bronchioles; increased hyperplasia with decreased differentiation of polymorphous cells; metaplasia; and anaplasia. Adenomas were observed in 65 mice given urethan alone or a combination of urethan and influenza virus; 19 showed signs of malignancy. Cancerous tumors developed only in 13 mice given both urethan and influenza virus: six were adenocarcinomas and seven were solid oat-cell, alveolar cell or polymorphocellular carcinomas. Most of these tumors developed five or six months after infection with influenza virus.

3735 ACUTE HEPATIC INJURY BY VINYL CHLORIDE IN RATS PRETREATED WITH PHENOBARBITAL. *(E.)*

Jaeger, R. J. (Kresge Cent. Environ. Health, Harvard Sch. Public Health, Boston, Mass.), E. S. Reynolds, R. B. Conolly, M. T. Moslen, S. Szabo and S. D. Murphy. *Nature* 252(5485):724-726, 1974.

The potential of vinyl chloride monomer to enhance liver injury in male Holtzman rats pretreated with phenobarbital, an inducer of certain enzymes of the liver mixed function oxidase system, was studied. Four experimental groups were defined: exposed to air and not pretreated; exposed to vinyl chloride monomer and not pretreated; exposed to air and pretreated with phenobarbital (0.1% in drinking water for 7 days); and exposed to vinyl chloride monomer and pretreated with phenobarbital. Nonpretreated and phenobarbital-pretreated rats exposed to air alone had no increase in serum alanine-α-ketoglutarate transaminase (AKT) and sorbitol dehydrogenase, enzymes that are highly specific for liver injury. In nonpretreated groups, exposure to 0.5% or 5% vinyl chloride monomer for a single six hour period did not cause a substantial rise in serum alanine-α-ketoglutarate transaminase or sorbitol dehydrogenase, but after exposure to 10% vinyl chloride monomer there was a slight increase in these enzymes. Histologically, centrolobular hepatocellular vacuolization was noted only in the 10% exposure group. Phenobarbital pretreatment for seven days caused a marked enhancement of injury at the 5% level of exposure, with vacuolization of centrolobular parenchymal cells, focal necrosis of mid-zonal parenchyma, dilation of the rough endoplasmic reticulum, and formation of tubular snarls by smooth endoplasmic reticulum. Phenobarbital-pretreated rats killed after the last exposure to 5% vinyl chloride monomer following 5 consecutive days of exposure did not have increased activities of serum alanine-α-ketoglutarate transaminase or sorbitol dehydrogenase, suggesting that previous exposure to vinyl chloride monomer blocked the biochemical response which followed reexposure at short intervals.

3736 THE EFFECT OF ε-N-DL-TRIMETHYL-LYSINE ON HUMAN LYMPHOCYTE CULTURES. *(E.)*

Stotz, G. (Semmelweis Med. U., Budapest, Hungary), B. Szende, K. Lapis and E. Tyihak. *Exp Pathol* 9(5/6):317-322, 1974.

3737 CYTOPLASMIC ALTERATIONS OF HEPATOCYTES IN RAINBOW TROUT (*SALMO GAIRDNERI*) INDUCED BY CYCLOPROPENOID FATTY ACIDS. *(E.)*

Scarpelli, D. G. (U. Kansas Med. Ctr., Kansas City), D. J. Lee, R. O. Sinnhuber and M. Chiga. *Cancer Res* 34(11):2984-2990, 1974.

38 HORMONAL CONTROL OF PHENOTYPIC EXPRESSION IN MOUSE MELANOMA CELLS. *(E.)* Wong, G. L.
le U., New Haven, Conn.). *Diss Abst Int B*
6):2636-B, 1974.

39 CHARACTERIZATION OF AN ESTROGEN-SENSITIVE CELL LINE ESTABLISHED FROM NORMAL RAT ENDO-
TRIUM. *(E.)* Sonnenschein, C. (Tufts U. Sch. Med.,
ston, Mass.), S. Weiller, R. Farookhi and A. M.
to. *Cancer Res* 34(11):3147-3154, 1974.

40 INITIATION OF PROLIFERATION OF DENSITY-INHIBITED FIBROBLASTS BY GLUCOCORTICOIDS.
.) Thrash. C. R. H. (U. California, Irvine). *Diss*
st Int B 35(6):2913-B-2914-B, 1974.

41 STUDIES ON ESTROGEN-INDUCED PROLIFERATIVE DISORDERS OF HEMOPOIETIC TISSUE IN DOGS.
.) Chiu, T. (U. Minnesota, Minneapolis). *Diss*
st Int B 35(6):3104-B, 1974.

42 EFFECT OF 2-NITROSONAPHTHALENE ON BACTERIA AND BACTERIOPHAGE. *(E.)* Tagashira, Y.
emple U. Sch. Med., Philadelphia, Pa.), S. Fukuda
d N. Yamamoto. *Cancer Res* 34(11):3102-3106, 1974.

743 GAS CHROMATOGRAPHIC-MASS SPECTROMETRIC DETERMINATION OF *N*-NITROSODIMETHYLAMINE
ORMED IN SYNTHETIC AND HUMAN GASTRIC JUICE. *(E.)*
ane, R. P. (Dept. Food Sci. Nutr., U. Missouri,
olumbia), R. H. Rice and M. E. Bailey. *J Agr Food*
hem 22(6):1019-1023, 1974.

744 THE ALKYLATION OF NUCLEIC ACIDS OF RAT AND MOUSE *IN VIVO* BY THE CARCINOGEN 1,2-DIMETHYL-
YDRAZINE. *(E.)* Hawks, A. (Middlesex Hosp. Med. Sch.,
ondon, England) and P. N. Magee. *Br J Cancer* 30(5):
40-447, 1974.

745 ANGIOSARCOMA OF THE LIVER IN VINYL CHLORIDE/POLYVINYL CHLORIDE WORKERS. *(E.)* Lloyd,
. W. (Off. Occupational Hlth. Surveillance Biometrics,
IOSH, Rockville, Md.). *J Occup Med* 16(12):809, 1974.

3746 FUNCTIONAL AND BIOCHEMICAL EFFECTS ON THE LUNG FOLLOWING INHALATION OF CIGARETTE SMOKE
AND CONSTITUENTS. II. SKATOLE, ACTOLEIN, AND ACETALDEHYDE. *(E.)* Watanbe, T. (Sch. Med., U. Pennsylvania,
Philadelphia) and D. M. Aviado. *Toxicol Appl Pharmacol* 30(2):201-209, 1974.

3747 TOXICITY OF AFLATOXIN Q_1 AS EVALUATED WITH THE CHICKEN EMBRYO AND BACTERIAL AUXOTROPHS. *(E.)* Hsieh, D. P. H. (Dept. Environmental Toxicol., U. California, Davis), A. S. Salhab, J. J. Wong and S. L. Yang. *Toxicol Applied Pharmacol* 30(2):237-242, 1974.

3748 DISAPPEARANCE OF METASTATIC BREAST CANCER AFTER OOPHORECTOMY. *(E.)* Mecklenburg, R. S. (Natl. Inst. Health, Bethesda, Md.) and M. B. Lipsett. *N Engl J Med* 289(6):845-846, 1973.

3749 ON THE BEHAVIOUR OF DEOXYRIBONUCLEASES DURING CARCINOGENESIS. *(E.)* Tempel, K. (Vet. Med. Fac., Univ. Munich, West Germany) and R. Hollatz. *Naunyn Schmiedebergs Arch Pharmacol* 282:98, 1974.

3750 SHORT-TERM TOXICITY OF CYCLOHEXYLAMINE HYDROCHLORIDE IN THE RAT. *(E.)* Gaunt, I. F. (British Ind. Biol. Res. Assoc., Surrey, England), M. Sharratt, P. Grasso, A. B. G. Lansdown and S. D. Gangolli. *Food Cosmet Toxicol* 12(5/6):609-624, 1974.

3751 LONG-TERM ADMINISTRATION OF STERIGMATOCYSTIN AND *PENICILLIUM VIRIDICATUM* TO MICE. *(E.)* Zwicker, G. M. (Sch. Vet. Sci., Med., Purdue U., West Lafayette, Ind.), W. W. Carlton and J. Tuite. *Food Cosmet Toxicol* 14(4):491-497, 1974.

3752 CARCINOGENIC EFFECTS OF LOW DIETARY LEVELS OF AFLATOXIN B_1 IN RATS. *(E.)* Wogan, G. N. (Dept. Nutr. Food Sci., Massachusetts Inst. Technol., Cambridge), S. Paglialunga and P. M. Newberne. *Food Cosmet Toxicol* 12(5/6):681-685, 1974.

3753 CHRYSENE AND METHYLCHRYSENES: PRESENCE IN TOBACCO SMOKE AND CARCINOGENICITY. *(E.)* Hecht, S. S. (American Health Fdn., New York, N.Y.), W. E. Bondinell and D. Hoffmann. *J Natl Cancer Inst* 53(4):1121-1133, 1974.

3754 EFFECT OF THE URINE AND CALCULUS FORMATION ON THE INCIDENCE OF BLADDER TUMORS IN RATS IMPLANTED WITH PARAFFIN WAX PELLETS. *(E.)* Chapman, W. H. (No affiliation), D. Kirchheim and J. W. McRoberts. *Food Cosmet Toxicol* 12(4):592-594, 1974.

3755 INDUCTION OF TUMORS BY ETHYLHYDRAZINE HCl: MORPHOLOGIC STUDIES. *(E.)* Shimizu, H. (Univ. Nebraska Med. Cent., Omaha) and B. Toth. *Am J Pathol* 74(2):98a-99a, 1974.

3756 A LIFESPAN STUDY OF A POLYDIMETHYLSILOXANE IN THE MOUSE. *(E.)* Cutler, M. G. (Med. Sch., Birmingham, England), A. J. Collings, I. S. Kiss and M. Sharratt. *Food Cosmet Toxicol* 12(4): 443-450, 1974.

3757 TUMOURS AND HORMONAL CHANGES PRODUCED IN RATS BY SUBCUTANEOUS INJECTIONS OF LINOLEIC ACID HYDROPEROXIDE. *(E.)* Cutler, M. G. (Med. Sch., Birmingham, England) and R. Schneider. *Food Cosmet Toxicol* 12(4):451-459, 1974.

3758 THE COMPLEXITIES OF PYRROLIZIDINE ALKALOID TOXICITY. *(E.)* Cooper, P. (British Ind. Biol. Res. Assoc., Surrey, England). *Food Cosmet Toxicol* 12(4):559-563, 1974.

3759 AN *IN VITRO* STUDY OF CYTOSTATIC DRUG EFFECT ON THE DNA SYNTHESIS IN METHYLCHOLANTHRENE INDUCED MOUSE SARCOMAS. CORRELATION BETWEEN *IN VITRO* RESULTS AND THE RESPONSE *IN VIVO*. *(E.)* Trope, C. (Dept. Anat., U. Lund, Sweden) and L. Hakansson. *Acta Pathol Microbiol Scand* [A] 82(2):189-198, 1974.

3760 CELL CLONES WITH DIFFERENT SENSITIVITY TO CYTOSTATIC DRUGS IN METHYLCHOLANTHRENE-INDUCED MOUSE SARCOMAS. *(E.)* Hakansson, L. (Dept. Anat., U. Lund, Sweden) and C. Trope. *Acta Pathol Microbiol Scand* [*A*] 82(1):41-47, 1974.

3761 PURIFICATION AND SOME PROPERTIES OF γ-GLUTAMYL TRANSPEPTIDASE FROM AZO DYE-INDUCED HEPATOMA. *(E.)* Taniguchi, N. (Hokkaido U. Sch. Med., Sapporo, Japan). *J. Biochem* 75(3):473-480, 1974.

3762 CELL DIFFERENTIATION AND TUMOR-PROMOTING ACTION IN SKIN CARCINOGENESIS. *(E.)* Raick, A. N. (Dept. Pathol., U. Toronto, Canada). *Cancer Res* 34(11):2915-2925, 1974.

3763 EXPERIMENTAL TERATOMAS. *(E.)* Gaillard, J. A. (Hosp. Ctr., Evreux, France). *Nouv Presse Med* 3(27):1725, 1974.

3764 RECEPTOR TRANSFORMATION IN ESTROGEN ACTION. *(E.)* Jensen, E. V. (Ben May Lab. Cancer Res., U. Chicago, Ill.), P. I. Brecher, S. Mohla and E. R. DeSombre. *Acta Endocrinol* [*Suppl 191*] *(Kbh)* 77:159-172, 1974.

3765 AUTOANTIBODIES AND SERUM IMMUNOGLOBULIN LEVELS IN ASBESTOS WORKERS. *(E.)* Lange, A. (Med. Acad., Wroclaw, Poland), R. Smolik, W. Zatonski and J. Szymanska. *Int Arch Arbeitsmed* 32(4):313-325, 1974.

3766 THE DENSITIES OF COLLOIDAL IRON HYDROXIDE PARTICLES BOUND TO MICROVILLI AND THE SPACES BETWEEN THEM: STUDIES ON GLUTARALDEHYDE-FIXED EHRLICH ASCITES TUMOUR CELLS. *(E.)* Weiss, L. (Roswell Park Mem. Inst., Buffalo, N.Y.) and J. R. Subjeck. *J Cell Sci* 14(1):215-223, 1974.

3767 A STUDY OF THE HISTOLOGICAL CELL TYPES OF LUNG CANCER IN WORKERS SUFFERING FROM ASBESTOSIS IN THE UNITED KINGDOM. *(E.)* Whitwell, F. (London Sch. Hyg. Trop. Med., England), M. L. Newhouse and D. R. Bennett. *Br J Ind Med* 31(4):298-303, 1974.

3768 FINE STRUCTURAL CHANGES IN RAT PROSTATE 5 MONTHS AFTER THE EXPERIMENTAL INTRODUCTION OF 20-METHYLCHOLANTHRENE. *(E.)* Aughey, E. (Roy. Infirm., Glasgow, Scotland), R. Scott and I. McLaughlin. *Br J Urol* 46(5):561-568, 1974.

3769 THE PROTECTIVE EFFECT OF HYDANTOIN TREATMENT ON CARCINOGENESIS. *(E.)* Levo, Y. (Beilinson Med. Ctr., Petach Tikvah, Israel). *Naunyn Schmiedebergs Arch Pharmacol* 285(1):29-30, 1974.

3770 COMPARISON OF TUMOR TRANSPLANT ENHANCEMENT BY L-ASPARAGINASE AND ENDOTOXIN. *(E.)* Henderson, J. S. (Fac. Med., U. Manitoba, Winnipeg, Canada). *J Reticuloendothel Soc* 15(6):19a, 1974.

3771 THE MECHANISM OF ACTION OF OESTROGEN IN THE HUMAN FEMALE. *(E.)* Taylor, R. W. (St. Thomas's Hosp., London, England). *J Obstet Gynecol Br Commonw* 81(11):856-866, 1974.

3772 INHIBITION AND ENHANCEMENT OF FRIEND LEUKEMIA VIRUS BY PYRAN COPOLYMER. *(E.)* Schuller, G. B. (Med. Coll. Virginia, Richmond), P. S. Morahan and M. J. Snodgrass. *J Reticuloendothel Soc* 15(6):16a, 1974.

3773 DOSE AND GERM CELL STAGE DEPENDENCE OF STRONTIUM 89 MUTAGENIC EFFECTS IN RAT MALES. *(E.)* Bairakova, A. K. (Res. Inst. Radiobiol. Radiat. Hyg., Sofia, Bulgaria). *Strahlentherapie* 148(4):394-396, 1974.

3774 THE BLASTOMOGENIC ACTION OF SINESTROL DURING INTRAVAGINAL INSERTIONS. *(E.)* Volfson, N. I. (Res. Inst. Oncol., USSR Min. Pub. Health, Leningrad). *Neoplasma* 21(5):569-576, 1974.

3775 TRANSPLANTATION OF CHEMICALLY INDUCED ADENOCARCINOMAS OF THE COLON IN AN INBRED STRAIN OF RATS. *(E.)* McCall, D. C. (Yale U. Sch. Med., New Haven, Conn.) and J. W. Cole. *Cancer* 33(4):1021-1026, 1974.

76 WERE CANCER FACTS KEPT FROM WORKERS? *(E.)* Anonymous. *Med World News* 15(40):46, 1974.

77 VIRUS-LIKE PARTICLES IN BRAIN TUMOURS INDUCED BY N-ETHYL-N-NITROSOUREA IN RATS. *.)* Lantos, P. L. (Middlesex Hosp. Med. Sch., ndon, England). *Acta Neuropathol (Berl)* 20(3): 1-222, 1974.

78 THE FINE STRUCTURAL LOCALISATION OF THIAMINE PYROPHOSPHATASE AND ADENOSINE TRIPHOS-ATASE IN NEURAL TUMOURS INDUCED BY N-ETHYL-N-NITRO-UREA IN RATS. *(E.)* Lantos, P. L. (Middlesex Hosp. d. Sch., London, England). *Acta Neuropathol (Berl)* (3):199-209, 1974.

See also:

* (Rev): 3602, 3603, 3604, 3605, 3623, 3635, 3636
* (Phys): 3782
* (Viral): 3788, 3805, 3816, 3904
* (Immun): 3925, 3933, 3955, 4015
* (Path): 4058
* (Epid-Biom): 4078, 4079, 4094

3779 ACID AND ENZYMATIC HYDROLYSIS OF MODIFIED THYMINE FRAGMENTS LINKED TO THE POLYNUCLEOTIDE CHAIN AFTER γ-IRRADIATION *IN VITRO* OF DNA FROM *E. COLI*. *(Fr.)* Teoule, R. (Nucl. Res. Cent., Grenoble, France), A. Bonicel, C. Bert, J. Cadet, M. Polverelli and B. Fouque. *C R Acad Sci [D] (Paris)* 279(23):1797-1799, 1974.

Various concentrations of *Escherichia coli* DNA were subjected to γ-radiation in aerated and unaerated aqueous solutions. The DNA chain was then subjected to hydrolysis with formic acid, enzymatic hydrolysis with formic acid, or enzymatic hydrolysis with homogenates of *E. coli*. After chromatographic separation, radiolysis products were characterized by specific microreactions. The products of γ-radiation in aerated solutions were *cis*-5,6-dihydroxy-5,6-dihydrothymine; *trans*-5,6-dihydroxy-5,6-dihydrothymine; and 5-hydroxy-5-methylhydantoin. Products of γ-radiation in unaerated solution were *cis*-5,6-dihydroxy-5,6-dihydrothymine; *trans*-5,6-dihydroxy-5,6-dihydrothymine; 5-hydroxydihydrothymine; 6-hydroxydihydrothymine; and 5,6-dihydrothymine.

3780 THE POSSIBLE ROLE OF PRIOR RADIOTHERAPY IN THE GENESIS OF MULTIPLE BASOCELLULAR EPITHELIOMAS AND PINKUS FIBROEPITHELIAL TUMORS LOCATED IN THE LUMBOSACRAL REGION. *(Fr.)* Colomb, D. (No affiliation), F. Vittori and R. Perraud. *Ann Dermatol Syphiligr (Paris)* 81(2):153-158, 1974.

Case reports are presented for 4 patients with various histologic types of both basal cell epitheliomas and Pinkus tumors (premalignant fibroepitheliomas) in the lumbosacral region. The two types of tumors were shown to be related by the blending of the lesions in the lumbar region and by their juxtaposition with a transitional zone between them in 2 histologic specimens. In one case, the tumors seemed to result from a personal constitutional predisposition. In the other cases, the patients had been exposed to intensive radiotherapy four yr (in one case) and 26 yr (in two cases) earlier. There was no clinical radiodermitis. These findings agree with those of another study in the literature and the authors conclude that radiotherapy increases potential proliferation of primary epithelial cells to develop as basocellular and fibroepithelial lesions. The absence of radiodermitis is associated with the development of Pinkus tumors.

3781 LIVER STUDIES IN THE THOROTRAST PATIENTS - LABORATORY AND CLINICAL FINDINGS (STUDY OF 175 CASES). *(E.)* Tavares, M. H. (Dept. Pathol., Fac. Med., U. Lisbon, Portugal), A. Saragoca and J. da Silva Horta. *Proc Third Int Meeting Toxicity Thorotrast, Copenhagen, Denmark:*212-218, April 1973.

The clinical and laboratory findings in 86 men and 89 women aged 22-87 yrs who had been injected with Thorotrast were studied. The subjects had received 4-70 ml of Thorotrast 10-41 years previously. The clinical complaints were most often related to the gastrointestinal pathology, primarily concerning the liver. The laboratory tests revealed a serum dysproteinemia (low albumin and increased α-2 and γ-globulin) and increased levels of alkaline phosphatase. α-Fetoprotein was looked for in 10 cases, and was absent in each. In 25 cases, liver tissue was available for histological examination. Eleven tumors (four hemangioendotheliomas, five cholangiocarcinomas, and two adenocarcinomas) were found. The remaining 14 cases showed hepatic fibrosis. The clinical and laboratory findings were more closely related to the time elapsed since injection of the drug than to the dosage given.

3782 CHROMOSOMAL ABERRATIONS IN RADIATION AND CHEMICAL CARCINOGENESIS. *(Rus.)* V. Kh. Kim (Sci. Res. Inst. Med. Radiology, USSR Acad. Med Sciences, Obninsk). *Tsitologia* 15(5):578-584, 1973.

Studies were carried out on chromosomal aberrations in murine hepatic cells at different stages of development of hepatomas induced by the separate and the combined action of irradiation (2,000 rads) and implantation of O-aminoazotoluene (OAAT) pills under the skin monthly for ten months. The total of 187 C3HA mice were divided into five groups: OAAT group, irradiated mice, OAAT mice with subsequent irradiation, irradiated mice receiving OAAT, and the controls. In the group of irradiated mice, the incidence of chromosomal aberrations fell from 83% to 43% between the 1st and 5th months of the experiment; by the 6th month, it rose to 66%, and 12 months after the experiment began it approached the control level. The action of OAAT alone resulted in a constant accumulation of chromosomal mutations in hepatocytes. In the animals exposed to the combined action, the number of mutations increased sharply at the beginning, then fell by the 4th month, and rose again to 88.9% in mice exposed to irradiation after OAAT, and to 63.7% in irradiated mice receiving OAAT. In all OAAT groups, tumor development was accompanied by a high incidence of chromosomal mutations. In 12-month OAAT survivors, the incidence of tumors ranged from 92% to 99%. In irradiated mice, the first tumor was observed after 12 months; the tumor incidence after 20 months was 9%. The findings indicate that tumor development is not necessarily accompanied by chromosomal mutations. The combined action of the two carcinogenic effects resulted in earlier tumor growth.

3783 EXCRETION AND ACUTE TOXICITY OF $^{239}PuO_2$ IN BABOONS. *(E.)* Metivier, H. (Lab. Exp. Toxicol., Montrouge, France), D. Nolibe, R. Masse and J. Lafuma. *Health Phys* 27(5):512-514, 1974.

3784 RADIONUCLIDES AND BONE--FROM ^{226}Ra TO ^{90}Sr. *(E.)* Spiers, F. W. (Dept. Med. Phys., U. Leeds, England). *Br J Radiol* 47(564):833-844, 1974.

3785 SKIN CANCER: SELF-PREVENTION BY CELLS. *(E.)* Anonymous. *Sci News* 106(20):310-311, 1974.

6 THE IMPORTANCE OF THE IONIZING RADIATION AS A CARCINOGENIC FACTOR IN THE OCCUPATIONAL IRONMENT. *(Ger.)* Schuttmann, W. (East German te Office Atomic Safety, Radiation Protection, lin). *Arch Geschwulstforsch* 43(4):384-397, 1974.

See also:

* (Rev): 3636
* (Viral): 3797, 3816, 3864, 3865
* (Immun): 3955

3787 INCORPORATION OF [^{14}C]-2 DEOXY-D-GLUCOSE INTO THE LIPIDS OF NORMAL CELLS AS COMPARED TO VIRUS-TRANSFORMED CELLS. *(E.)* Steiner, M. R. (Baylor Coll. Med., Houston, Tex.), K. Somers and S. Steiner. *Biochem Biophys Res Commun* 61(2):795-801, 1974.

^{14}C-2-deoxy-D-glucose is incorporated into the glycolipids of both normal and transformed cells. The chromatographic patterns of ^{14}C-2-deoxy-D-glucose labeled lipids differed markedly in oncornavirus- and herpes simplex virus-transformed cells as compared with normal and virus-infected but untransformed cells. Deoxyglucose-labeled lipids with intermediate chromatography were decreased in transformed cells while those with both higher and lower mobility were increased. Study of the distribution of labeled glycolipids in murine sarcoma virus-transformed normal rat kidney cells grown at permissive and nonpermissive temperatures showed that the altered chromatographic pattern of labeled lipids was related to the expression of the transformed phenotype. ^{14}C-2-deoxy-D-glucose lipid patterns may be a useful marker for transformation.

3788 VIRALLY TRANSFORMED CELLS AND CYTOCHALASIN B. I. THE EFFECT OF CYTOCHALASIN B ON CYTOKINESIS, KARYOKINESIS AND DNA SYNTHESIS IN CELLS. *(E.)* Hirano, A. (Pasaka Prefect. Inst. Public Health, Japan) and T. Kurimura. *Exp Cell Res* 89(1):111-120, 1974.

The effects of cytochalasin B on cytokinesis, karyokinesis, and DNA synthesis of various cells transformed by DNA viruses [simian virus 40 (SV40), polyoma, and adenovirus 12] and of nontransformed cells were studied. Cytokinesis of all cell lines was completely inhibited by cytochalasin B at concentrations of 0.5-0.2 μg/ml. After incubation in cytochalasin B, nontransformed cells became bi- or trinucleated without division of the cytoplasm. Of the virally transformed cells, BALB/3T3, BHK21, SPY, TS-5, and HT-102 cells also became bi- or trinucleated after cytochalsin B treatment, with a small number of multinucleate cells. In contrast, SV40-transformed mKS-A and mKS-A Tu-7 cells became highly multinucleated in the presence of cytochalasin B. On the 4th day, 90% of mKS-A cells had more than 5 nuclei and about 40% of cells contained more than 10 nuclei. Upon removal of cytochalasin B, cytoplasmic division recovered rapidly, 70-80% of the cells becoming mono- or binucleate. Cytochalasin B inhibited DNA synthesis in nontransformed cells but not in transformed cells.

3789 *IN VITRO* TRANSCRIPTION OF RNA TUMOR VIRUS GENES IN THE CHROMATIN OF UNINFECTED CHICKEN CELLS. *(E.)* Astrin, S. M. (Fox Chase Cancer Ctr., Philadelphia, Pa.). *Biochem Biophys Res Commun* 61(4):1242-1248, 1974.

Chromatin isolated from chicken embryo cells, which have been shown to contain sequences of tumor virus DNA in an integrated state, was transcribed *in vitro* with *E. coli* RNA polymerase and the transcripts were assayed for the presence of viral RNA. RNA transcribed from the chromatin of cells in which viral gene functions are expressed contained readily detectable quantities of viral RNA; in contrast, RNA transcribed from chromatin of cells in which viral gene functions are expressed poorly or not at all contained little, if any, viral RNA. These results parallel the results obtained with RNA isolated from the two cell types. The findings indicate that the control mechanism regulating the transcription of endogenous viral genes in chicken cells can be studied in an *in vitro* system with isolated chromatin.

3790 COMPARATIVE STUDIES ON FUNCTIONS OF HUMAN ADENOVIRUS TYPE 12 AND ITS LOW ONCOGENIC MUTANT VIRIONS. *(E.)* Ezoe, H. (Dep. Biol., McMaster Univ., Hamilton, Canada) and S. Mak. *J Virol* 14(4):733-739, 1974.

The physical and biological properties of highly oncogenic human adenovirus type 12 were compared with a low oncogenic mutant (cyt mutant). Both the mutant and parental viruses were grown in human KB cells. Parental and cyt mutant variants had a similar density in CsCl and a similar DNA size. However, the parental strain virion preparation contained a much higher proportion of defective virions (capable of cell killing but not able to induce T- or V-antigens) than cyt mutant stock. Compared with the parental strain, the cyt mutant had a reduced virus yield not only in KB cells but also in human HEp-2 and HEK cells. The data indicate that the viral genes responsible for cell killing are not identical with those for T-antigen synthesis and also show that parental virus preparations have a greater degree of functional heterogeneity than the mutant preparations.

3791 TRANSFORMATION POTENTIALS OF THE NONINFECTIOUS (DEFECTIVE) COMPONENT IN POOLS OF ADENOVIRUSES TYPE 12 AND SIMIAN ADENOVIRUS 7. *(E.)* Schaller, J. P. (Dept. Vet. Pathobiol., Ohio State U., Columbus) and D. S. Yohn. *J Virol* 14(2):392-401, 1974.

Pools of adenovirus 12 and simian adenovirus 7 were separated into four or five fractions by density gradient centrifugation in cesium chloride. Each fraction was analyzed for total *in vitro* infectivity units, total transformation activity, and total virus particle (VP) content. Two major subpopulations were separated with mean densities of 1.30 ± 0.02 and 1.34 ± 0.02 g/ml, resp. Virions in the 1.34 g/ml range were highly infectious (10^2 to 10^3 VP/infectivity unit) in contrast to virions with densities of 1.30 g/ml (10^4 to 10^5 VP/infectivity unit). Transformation capacity was evenly distributed throughout the fractions of both viruses, indicating that genetically incomplete or defective virus particles were not deficient in their ability to induce transformation. The average VP/transformation unit for adenovirus 12 (2.85×10^6) and for simian adenovirus 7 (4.00×10^6) did not vary significantly from fraction to fraction. These values were obtained with optimal input multiplicities of 16-64 VP/cell. At higher multiplicities, the apparent increase in VP/transformation unit was attributable to the viral

ocidal effect on hamster cells. The data indi-
ed that quantitation of *in vitro* transformation
ed on VP multiplicities was more reliable than
t based on infectious units. These estimates were
ependent of method of virus production, extrac-
n, and purification.

92 AVIAN TUMOR VIRUS PROTEINS AND RNA IN UN- INFECTED CHICKEN EMBRYO CELLS.

(E.) Chen,
H. (Rockefeller U., New York, N.Y.), W. S. Hayward
l H. Hanafusa. *J Virol* 14(6):1419-1429, 1974.

e content of proteins P19 and P15 (molecular wt
,000 and 15,000, resp.) of avian leukovirus in
rious types of uninfected chick embryos was de-
rmined by radioimmunoassay. All chicken embryos
amined, including those which have so far been
assified as group-specific (gs) antigen negative
complement-fixation tests, contained these viral-
oteins as well as the previously reported P27.
e embryos known as gs antigen-positive type con-
ined about five times as much of these viral pro-
ins as did the gs antigen-negative type. The ra-
o of the three viral proteins was similar for all
pes of embryos, suggesting that the genes for
ese proteins are coordinately controlled. In con-
ast to the relatively high levels of viral inter-
l proteins in gs antigen-negative cells, the
ounts of virus-specific RNA detectable by mole-
lar hybridization were extremely low. Levels of
lper activity, which presumably reflect the level
viral envelope glycoprotein, were also generally
w or undetectable in these cells. Thus, the ex-
ession of the gene for envelope glycoprotein does
t appear to be controlled coordinately with the
enes for viral internal proteins.

93 LOCALIZATION OF MAJOR GROUP-SPECIFIC POLY- PEPTIDES IN THE AVIAN RNA TUMOR VIRUSES.

.) Polakova, K. (Cancer Res. Inst., Slovak Acad.
ci., Bratislava, Czechoslovakia) and G. Russ.
ochem Biophys Res Commun 57(4):1130-1136, 1974.

ntact avian myeloblastosis virus (BAI strain) was
odinated with chloramine-T and ^{125}I. Polyacrylamide
el electrophoresis revealed that the major glycopro-
ein and glycolipids were maximally labeled after
-2 sec exposure of the intact virus to the iodina-
ion agents, whereas the group-specific (gs) polypep-
ides had just begun to acquire label. Unequal label-
ng of four gs polypeptides was demonstrated with an
xposure time of 10 sec, the largest polypeptide 4
molecular wt 23,000) being preferentially iodinated.
he electrophoretic pattern obtained after 5-min ex-
osure of the intact virus to iodination agents was
imilar to that observed when virus was disrupted by
riton-X-100 suggesting that all reactive groups in
ntact virus are accessible for iodination with chlor-
mine T. Labeling of intact virus by the noninvasive
actoperoxidase technique led to extensive iodination
f only the major virion glycoprotein and glycolipids;
all four gs polypeptides were very poorly iodinated.
It is concluded that protein 4 surrounds other gs
polypeptides and is itself wholly enclosed by the
glycolipid bilayer.

3794 AVIAN VIRUS-INDUCED LEUKEMIA—A MODEL OF CELL DIFFERENTIATION.

(E.) Moscovici, C. (VA Hosp., Gainesville, Fla.). *Bibl Haematol* (39): 923-928, 1973.

The properties of avian myeloblastosis virus, its interaction with hematopoietic and nonhematopoietic cells, and the spontaneous regression of AMV-induced leukemia in chickens are discussed. Attempts were made to retrieve AMV from nonproducer myeloblasts challenged with associated viruses derived from the four groups of the Rous sarcoma complex in addition to the two AMV-associated viruses. Rescue was obtained with members of subgroups C and D and with nontransforming associated viruses derived from the MC 29 strain. The rescued progeny were able to induce a myeloblastic leukemia in chickens. In studies of spontaneous regression of leukemia, AMV was injected into 12-day-old Kimber (C/O and C/B) embryos by various routes. Only in eggs injected *via* egg sac did one bird show a definite disappearance of circulating myeloblasts in the peripheral blood. Results obtained with relatively AMV-resistant C/AB chickens show a correlation between leukemia regression and age of embryo at time of inoculation. Inoculation at age 16 days resulted in regression in four of four birds with leukemia, whereas inoculation at 12 days produced regression in only two of eight birds with leukemia. All C/AB chicks were negative for viremia during the acute stage of disease as well as during regression; in the susceptible phenotypes, viremia persisted even when leukemia had regressed. Buffy coats from regressed C/AB birds showed *in vitro* proliferation of myeloblasts. Bone marrows of the regressed birds had some areas of myeloblastic proliferation but no lymphoid reaction.

3795 TRANSFORMATION OF CHICKEN EMBRYO CELLS WITH DNA EXTRACTED FROM AVIAN VIRUS-PRODUCING NEOPLASTIC CELLS.

(E.) Fourcade, A. (Inst. Gustave-Roussy, Villejuif, France), T. Huynh and F. Lacour. *J Virol* 14(3):407-411, 1974.

DNA isolated from avian virus-producing leukemic myeloblasts induced virus production after 8-12 days, but not morphological transformation, in cultivated chicken fibroblasts. The recovered virus had the same biological characteristics as the original avian myeloblastosis virus (AMV)-BAI strain A and produced myeloblastosis and nephroblastomas when injected into chickens. Neutralization experiments with chicken anti-AMV-BAI strain A sera showed an antigenic similarity between the DNA-transformed virus and the original virus. Of 10 chickens injected with virus neutralized by anti-AMV-BAI serum, only one developed a myeloblastosis and nine survived infection 6 months without leukemia. In contrast, 10 of 10 controls injected with leukemia plasma died of leukemia. Virus induced in fibroblasts after treatment with DNA from a viral nephroblastic line gave only nephroblastoma when injected into chickens. Treatment of chicken embryo cells with DNA extracted from normal chicken embryos did not induce viral production. These results support the assumption that avian virus-induced neoplastic cells contain a DNA transcript of the viral genome. The experiments did not confirm the oncogene hypothesis that cells of most vertebrates contain the genome of C-type viruses that are vertically transmitted from parents to offspring.

3796 PRESENCE IN LEUKEMIC CELLS OF AVIAN MYELOBLASTOSIS VIRUS-SPECIFIC DNA SEQUENCES ABSENT IN NORMAL CHICKEN CELLS. *(E.)* Shoyab, M. (Dept. Microbiol. Immunol., U. California, Los Angeles), R. M. Evans and M. A. Baluda. *J Virol* 14(1):47-49, 1974.

^{3}H-labeled 35S RNA from purified avian myeloblastosis virus (AMV) was exhaustively hybridized with an excess of normal chicken DNA to remove all viral RNA sequences which are complementary to DNA from uninfected cells. The ^{3}H-RNA which failed to hybridize was isolated by hydroxylapatite column chromatography, which separates DNA-RNA hybrids from single-stranded ^{3}H-RNA. The residual RNA hybridized with leukemic chicken DNA but did not rehybridize with normal chicken DNA. This demonstrates conclusively that DNA from AMV-induced leukemic cells contains viral-specific sequences which are absent from DNA from normal cells.

3797 VIRUS-LIKE PARTICLES IN ^{224}Ra-INDUCED MURINE OSTEOSARCOMAS. *(E.)* Marquart, K. H. (Inst. Biol., Munich, Germany). *Beitr Pathol* 152(2): 116-126, 1974.

Four-wk-old female NMRI mice were injected i.p. with ^{224}Ra (36 or 12 μC/kg protracted over a 4-wk period). One mouse developed an osteoblastic osteosarcoma of the proximal part of the left femur and a metastatic tumor in the liver after 18 months; another developed an osteoblastic osteosarcoma of the os sacrum after 19 months; and the third developed a fibroblastic osteosarcoma of the mandibula after 24 months. The tumor tissues were investigated using electron microscopy. Spherical particles measuring 80 nm in diameter were found in all of the tumor tissues, including the liver metastasis. The particles consisted of two electron-dense, ring-shaped, membrane-like shells which concentrically surrounded an electron-lucent core. Nearly all of the particles with this doughnut-like ultrastructural appearance occurred in the cisternae of the rough-surfaced endoplasmic reticulum (RER) of the tumor cells. They were seldom observed in intracytoplasmic smooth-surfaced vacuoles or located free in the cytoplasmic matrix. Crescent-shaped particles were occasionally found budding into the cisternae of the RER from its membrane component. The ultrastructure, size, formation, and location of the particles are similar to those described for type A viral particles. The significance of the particles, especially as they relate to the pathogenesis of the malignant bone tumors, is not known.

3798 THE EVIDENCE FOR INVOLVEMENT OF TYPE C RNA TUMOR VIRUSES IN HUMAN ACUTE LEUKEMIA. *(E.)* Gallo, R. C. (Natl. Cancer Inst., Bethesda, Md.), R. E. Gallagher, M. G. Sarngadharan, P. Sarin, M. Reitz, N. Miller and D. H. Gillespie. *Cancer* 34(4):1398-1405, 1974.

RNA- and reverse transcriptase (RT)-containing viruses have been etiologically related to leukemia in several species of animals. There is no convincing report of the isolation of a similar virus from man. In the past few years, however, biochemical evidence for three components thought to be characteristic of type C viruses has been detected in human acute leukemic cells. An enzyme with physical and biochemical properties so far indistinguishable from viral RT has been purified from these cells. It was also recently shown that this enzyme is immunologically closely related to RT purified from type C primate RNA tumor viruses, much less to murine virus RT, and not at all to avian or feline. RNA has been detected in these cells with some nucleotide sequence relatedness to the genomic RNA of some murine and primate type-C viruses. The DNA product of the endogenous RT of human leukemic cells has nucleotide sequences related to murine and especially primate type C sarcoma viruses. Thus, certain virus-like components exist in human leukemic cells in a functional form within ribonucleoprotein particles which resemble animal type C viruses. However, if they represent virus, they are defective - not released under ordinary conditions - and a causal relationship to human neoplasia, if any, has not been shown and may be impossible to prove.

3799 MECHANISM OF STIMULATION OF MURINE TYPE-C RNA TUMOR VIRUS PRODUCTION BY GLUCOCORTICOIDS: POST-TRANSCRIPTIONAL EFFECTS. *(E.)* Wu, A. M. (Bionetics Res. Lab., Bethesda, Md.), M. S. Reitz, M. Paran and R. C. Gallo. *J Virol* 14(4):802-812, 1974.

The mechanism by which dexamethasone enhances the production of 5-iododeoxyuridine (IdU)-induced type-C virus was investigated in BALB/K3T3 cells. Stimulation of virus production by dexamethasone (10^{-6} M) was greatest when the steroid was added to cultures 24-48 hr after IdU (40 μg/ml) induction. Although this effect is late, time course experiments suggested that dexamethasone does not act to promote release of preformed virions. Cordycepin (15 μg/ml) abolished the stimulatory activity of dexamethasone when added to cells during the first 24 hr of virus induction, but had little effect when given 24-48 hr after induction. Conversely, mouse interferon (200 or 250 U/ml), which inhibits virus production, interfered with dexamethasone when added late or after removal of the steroid. Molecular hybridization experiments showed no detectable increase in Kirsten sarcoma-leukemia virus-specific RNA in cytoplasm of dexamethasone-treated (IdU-induced and uninduced) cells. These results suggest that the effect of dexamethasone on type-C virus production in this system is post-transcriptional. The steroid may work primarily by affecting the degree of association of free virus-specific mRNA to ribosomes or by enhancing initiation of polypeptide chain synthesis.

300 TYPE C VIRUSES OF BABOONS: ISOLATION FROM NORMAL CELL CULTURES. *(E.)* Todaro, G. J.
Natl. Cancer Inst., Bethesda, Md.), C. J. Sherr,
. E. Benveniste, M. M. Lieber and J. L. Melnick.
ell 2(1):55-61, 1974.

our new type-C viruses were isolated from putative-
y virus-negative baboon lung, kidney, and testicu-
ar cells by cocultivation with several permissive
ost cell lines. The baboon type-C viruses were in-
ectious for cells from various mammalian species,
ut have not replicated in any baboon cell lines
ested thus far. These viruses are distinguishable
rom other major classes of mammalian type C viruses,
ncluding previous isolates from primates, but are
losely related to endogenous feline viruses of the
D-114/CCC group. As demonstrated by immunologic
esting, viral host range, and nucleic acid hybridi-
ation studies, the baboon type-C viruses are close-
y related to one another and represent a distinct
ew class of endogenous primate type C viruses.

3801 IMMUNIZING AND INTERFERING ACTION OF NON-LEUKEMOGENIC C-TYPE MURINE VIRUS VARIANTS IN LEUKEMOGENESIS. *(E.)* Barski, G. (Inst. Gustave-Roussy, Villejuif, France) and J. K. Youn. *Bibl Haematol* (39):370-376, 1973.

Quantitative, comparative studies were made of the *in vitro* and *in vivo* behavior of low and high leukemogenic variants of Rauscher leukemia virus. When cultivated simultaneously under the same conditions, the two variants replicated *in vitro* and infected *de novo* virus-free C57BL mouse P cells with the same efficiency. The variants were indistinguishable by their ultrastructure and antigenic properties (infected cells reacting with anti-FMR but not with anti-Gross sera). However, when inoculated into BALB/c mice, the variants differed in their leukemogenic capacity by a factor of at least 10^5. A similar situation was found when nonpathogenic C-type viruses, antigenically Gross leukemia (GL) positive, were compared with their highly leukemogenic counterparts. Additionally, the nonleukemogenic GL type virus variants interfered efficiently with leukomogenesis when inoculated into newborn C3HeB/Fe mice 4-5 hr before challenge with passage A GL virus. The interfering action of the nonpathogenic C-type virus did not appear to involve an immunological mechanism or interferon-mediated GL inhibition. The most probable hypothesis implicates the mechanism of receptor blocking and viral substitution phenomenon. Extensive studies of these variants appear warranted, especially in natural epidemiological situations.

3802 HOST RANGE STUDIES ON XENOTROPIC TYPE C VIRUSES IN SOMATIC CELL HYBRIDS. *(E.)* Scolnick, E. M. (Natl. Cancer Inst., Bethesda, Md.) and W. P. Parks. *Virology* 59(1):168-178, 1974.

The genetic basis of the xenotropic virus restriction in mouse and rat cells was investigated with mouse and woolly monkey type C viruses. A series of mouse-rat somatic cell hybrids were isolated by a selection procedure which does not require mutagenesis or bromodeoxyuridine treatment of either parental cell line. Thioguanine-resistant Kirsten sarcoma virus-transformed nonproducer rat cells were fused to contact-inhibited mouse cells and the hybrids selected in soft agar containing hypoxanthine, aminopterin, and thymidine. The hybrids were free of spontaneous virus, but could be induced to produce virus using halogenated pyrimidine induction. For both N-tropic and B-tropic mouse viruses, N-type mouse X rat hybrids and B-type mouse X rat hybrids were permissive for the virus of homologous tropism and restrictive for the virus of opposite tropism. The mouse restriction of xenotropic viruses was dominant to NRK (rat) permissiveness. The woolly monkey type C virus, which grows in rat but not mouse cells, grew well and replicated in the mouse X rat hybrids. The data did not indicate whether the same or different loci control both the NB restriction and the xenotropic restriction.

3803 ERYTHROLEUKEMIA IN TWO INFANT CHIMPANZEES FED MILK FROM COWS NATURALLY INFECTED WITH BOVINE C-TYPE VIRUS. *(E.)* McClure, H. M. (Yerkes Regional Primate Ctr., Emory U., Atlanta, Ga.), M. E. Keeling, R. P. Custer, R. R. Marshak, D. A. Abt and J. F. Ferrer. *Cancer Res* 34(10):2745-2757, 1974.

Erythroleukemia and *Pneumocystis carinii* pneumonia were diagnosed in two of six infant chimpanzees *(Pan troglodytes)* fed from birth on unpasteurized milk from cows naturally infected with the bovine C-type virus. The chimpanzees died at 34 and 45 wk of age after a 5- to 6-wk illness characterized by lethargy, anorexia, leukocytosis, anemia, and progressive pneumonia. Blast cells and immature myeloid cells were prominent in bone marrow specimens and were present, although less conspicuous, in peripheral blood smears. At autopsy, both animals showed infiltration of neoplastic cells in the bone marrow, spleen, lymph nodes, and, to a much lesser extent, in the lungs, liver, and kidneys. Four chimpanzees in the milk-fed group and all six in the control group (fed a commercial preparation) are alive and apparently healthy. The experimental chimpanzees were all housed together, but only the two affected animals received milk during the immediate neonatal period from the cow that was the most reliable and abundant source of bovine C-type virus. Neither leukemia nor *P. carinii* pneumonia has been previously reported in chimpanzees. Electron microscopic and serological studies failed to demonstrate the presence of bovine C-type virus in either the milk-fed or control animals studied. However, the two leukemic chimpanzees died before their buffy-coat cells could be examined.

3804 TYPE C VIRUS IN LYMPHOCYTE CULTURES FROM COWS WITH LEUKEMIA. *(Rus.)* Valikhov, A. F. (All-Union Inst. Exp. Vet. Sci., USSR), G. A. Nadtochei, N. V. Baganova, L. G. Burba, G. A. Simonian and B. I. Surin. *Veterinariia* (4):43-45, 1974.

The results of an electron microscope examination of lymphocyte cultures from cows with leukemia are described. C-type particles were observed in lymphocyte cultures from all 13 leukemic animals involved in the experiment. The viral particles were mainly located extracellularly, clustered near the cytoplasmic membrane. The particles were made up of a central, electron-dense nucleoid surrounded by a membrane with an electron-transparent zone between. Gradient density centrifugation showed opalescent zones having the density of 1.14-1.17 g/ml and 1.20-1.22 g/ml. The former is characteristic of all oncornaviruses. An electron microscope study of materials from these zones demonstrated the presence of structures similar to C-type virus particles.

3805 ENDOGENOUS TYPE C PARTICLES FROM RAT EMBRYO CELLS TREATED WITH 5-BROMODEOXYURIDINE. *(E.)* Schwartz, S. A. (Dept. Pathol., U. Chicago, Ill.), S. Panem, E. Stefanski and W. H. Kirsten. *Cancer Res* 34(9):2255-2259, 1974.

Type C particles were released from secondary W/Fu rat embryo cell cultures following exposure to 10^{-4} M 5-bromodeoxyuridine for 36 hr. The particles were first detected in culture fluids by electron microscopy and uridine-^{3}H labeling 2 days after drug treatment. Maximal release of type C particles occurred between 8 and 10 days. All rat embryo cells treated with 5-bromodeoxyuridine eventually fluoresced against antiserum to antigens from 2 mouse leukemia viruses. Fewer than 1% of the analog-treated cells contained budding particles as judged using electron microscopy. The induced type C particles banded at buoyant densities of 1.16 to 1.18 g/ml in sucrose equilibrium gradients. Culture fluids from 5-bromodeoxyuridine-treated rat embryo cells contained DNA polymerase activity. The type C particles failed to transform mouse or rat cells *in vitro* and did not induce neoplasms in neonatal mice or rats. 5-Bromodeoxyuridine-treated rat embryo cells were not tumorigenic when injected into syngeneic newborns.

3806 A CYTOMEGALOVIRUS-INDUCED MEMBRANE ALTERATION INDICATING A VITAL ROLE FOR Ca^{2+} IN VIRUS REPLICATION. *(E.)* Garnett, H. M. (Poliomyelitis Res. Fdn., Johannesburg, South Africa). *S Afr J Sci* 70(3):93-94, 1974.

Cultured human embryonic fibroblasts (HEF) incubated in a medium containing tris-HCl, choline Cl, $MgCl_2$, and $CaCl_2$ with ATP actively take up isotopic calcium. The uptake is arrested by mersalyl and anti-smooth mucle actomyosin γ-globulin, and is not affected by anti-skeletel muscle actomyosin γ-globulin. HEF were infected with cytomegalovirus (CMV) and the ability to accumulate Ca^{2+} measured at various intervals thereafter. The rate of development of the ability to accumulate Ca^{2+} paralleled that of the development of virus-induced cytopathogenic effects (CPE), DNA, and virus production. Thus, an increased Ca^{2+} concentration within cells may cause them to lose their fibroblast shape and round up. The increased Ca^{2+} concentration may also initiate the virus replicative cycle. The role of Ca^{2+} in initiating the virus replicative cycle may be similar to the role played by the ion in mitogenesis.

3807 INTEGRATION OF EPSTEIN-BARR VIRUS DNA INTO CELLULAR DNA OF BURKITT LYMPHOBLASTS (RAJI CELL LINE). *(E.)* Becker, Y. (Hebrew U.-Hadassah Med. Sch., Jerusalem, Israel), J. Shlomai, E. Weinberg, A. Ben-Zeev and U. Olshevsky. *Israel J Med Sci* 10(1):1454-1457, 1974.

Purified Raji cell DNA was banded in neutral CsCl gradients and the DNA of each fraction was melted and hybridized with Epstein-Barr virus (EBV)-^{32}P-cRNA. Cellular DNA banded at a mean density of 1.700 g/ml (range 1.680-1.710 g/ml). Two peaks of ^{32}P-cRNA-DNA hybrids were detected; one peak at a density of 1.707 g/ml and the other at a density of 1.700 g/ml. Thus, the EBV-DNA sequences are tightly bound to cellular DNA molecules which have a density much lower than that of EBV-DNA (1.718 g/ml). Shearing of Raji DNA molecules resulted in the appearance of EBV-DNA sequences which banded at a density of 1.710 g/ml. Alkali denaturation of Raji cell DNA also showed that most of the EBV-DNA molecules banded at a density lower than that of free EBV-DNA. Only a small fraction of the viral DNA molecules banded at the density of denatured free EBV-DNA, most fragments remaining associated with cellular DNA.

3808 DOWN'S SYNDROME: ESTABLISHMENT OF LYMPHOBLASTOID CELL LINES WITH TRISOMY 21. *(E.)* Miyoshi, I. (Okayama U. Med. Sch., Japan), S. Yoshimoto, S. Fujiwara, K. Hiraki and S. Kimura. *Cancer* 33(3):739-742, 1973.

Continuously growing lymphoblastoid cell lines were established from the peripheral blood of three of 16 patients with Down's syndrome (DS) and from four of 20 normal donors. All the cultures from patients with DS revealed the presence of chromosome constitution of trisomy 21 and Epstein-Barr virus (EBV) particles. Although EBV capsid antibody levels were generally higher in DS, the frequency of and period to cell line establishment were similar between DS patients and normal individuals.

3809 PERSISTENCE OF EPSTEIN-BARR VIRUS DNA IN HUMAN TUMOR CELLS. *(E.)* zur Hausen, H. (Inst. Clin. Virol., U. Erlangen, W. Germany). *Bibl Haematol* (39):439-443, 1973.

Attempts were made to quantitate Epstein-Barr virus (EBV)-specific DNA in human tumor cells by hybridization of tumor cell DNA with EBV-cRNA. The cell lines examined included two (one a Raji line) derived from patients with Burkitt's lymphoma, one from a patient with monocytic leukemia, two from patients with nasopharyngeal carcinoma, two from patients with Hodgkin's disease, and one from a healthy donor. All cell lines were repeatedly negative for viral capsid antigens by immunofluorescence and for viral particles by electron microscopy. The counts obtained were compared with controls derived from DNA of umbilical cord leukocytes. The results show striking differences in hybridizability of the various EBV-negative lymphoblastoid lines and considerable variations in their numbers of viral genome equivalents. Exposure of chromosomal preparations

f Raji cells to *in situ* hybridizations revealed
umerous grains in association with interphase nu-
lei or metaphase chromosomes. The number of grains
xceeded that in control preparations by a factor of
bout 8, suggesting a specific association of EBV-
RNA with homologous DNA within these cells. These
lata show that EBV occurs in transformed human lym-
hoblastoid cell lines in a latent form and persists
in some lines without viral particle and viral cap-
sid antigen production.

3810 STUDIES ON ONCOGENIC PROPERTIES OF EPSTEIN-BARR VIRUS.

(E.) Gerber, P. (Natl. Inst. Hlth., Bethesda, Md.) and D. R. Deal. *Bibl Haematol* (39):428-438, 1973.

Evidence is presented to demonstrate that Epstein-Barr virus (EBV) has functions associated only with oncogenic DNA viruses. Leukocytes from donors with EBV antibodies showed autonomous growth after 30-60 days in culture and could be established in continuous culture for more than 4 yr. No long-term cultures were established with leukocytes from EBV-seronegative donors. Leukocytes from an EBV-seronegative donor showed a striking increase in DNA synthesis when infected with EBV; blastoid EBV-infected cells began to multiply at 20-35 days and became established lymphoid lines. By contrast, cells exposed to UV-inactivated EBV or to virus-free fluids, or stimulated with Candida extract, failed to grow and gradually degenerated. Newborn BALB/c mice inoculated i.p. with lymphoid cells following treatment with anti-mouse serum died between 14 and 27 days with a median survival of 10 days. The 50% lethal dose ranged from 1-10 x 10^6 cells depending on the cell line: EBV-transformed cells from two EBV-seronegative donors, a line derived from a Burkitt lymphoma, and a spontaneously transformed line from a normal donor. The tumors produced by these four lymphoid cell lines had similar histopathologic features, and the degree of metastasis and invasiveness was nearly identical. Some cells displayed intracellular and membrane immunofluorescence when tested with EBV antibody-containing serum. Both autonomous growth and invasive growth in a heterologous host are apparently related to the presence of the EBV genome. The virus may act by releasing cells from the normal regulatory control mechanism as suggested by the EBV-induced activation of DNA synthesis.

3811 PROPERTIES OF FELINE LEUKEMIA VIRUS. I. CHROMATOGRAPHIC SEPARATION AND ANALYSIS OF THE POLYPEPTIDES.

(E.) Graves, D. C. (Dept. Microbiol., Michigan State U., East Lansing) and L. F. Velicer. *J Virol* 14(2):349-365, 1974.

Rickard's strain of feline leukemia virus (FeLV) contains two large glycoproteins and five smaller polypeptides of molecular wt 100,000 (gp ≥ 100), 70,000 (gp70), 30,000 (p30), 21,000 (p21), 15,000 (p15), 11,200 (p11), and 10,000 (p10) when chromatographed on 6% agarose in the presence of 6 M guanidine hydrochloride (GuHCl). P21 is a minor component which was not previously described for mammalian leukemia-sarcoma viruses and may be analogous to the seventh protein found in avian viruses. Analysis on 4% agarose and by sodium dodecyl sulfate polyacrylamide gel electrophoresis revealed that gp ≥ 100 is actually ≥ 200,000 daltons and dissociates to polypeptides of approximately 100,000-115,000 daltons, whereas gp70 can be resolved into six stained bands ranging from 40,000-80,000 daltons despite being rechromatographed as a single symmetrical peak on 6% agarose. Rechromatography on 8% agarose was more effective than on 6% agarose or sodium dodecyl sulfate polyacrylamide gel electrophoresis for obtaining the five small polypeptides, especially p11 and p10, in a highly purified form suitable for further analysis and for obtaining more precise estimates of their molecular wt. Rechromatographed p30, p21, p15, p11, and p10 had molecular wt of 27,000, 18,000, 15,000, 12,000, and 12,000, resp., by coelectrophoresis with the marker proteins on sodium dodecyl sulfate polyacrylamide gel electrophoresis; thus, the latter two FeLV polypeptides comigrate to form one less band when compared to elution from agarose. The isoelectric points of p30 and p15 were 5.5 and 8.9, resp., after renaturation from GuHCl and 5.6 and 8.7, resp., when isolated from Tween-ether treated virus. Rechromatographed p30, p15, and p11, renatured by removing GuHCl with dialysis, reacted only with their homologous antisera in immunodiffusion analysis, indicating that they are immunologically unrelated. The interspecies gs-3 determinant associated with p30 could be regained by removal of GuHCl.

3812 ELECTRON MICROSCOPY OF EARLY INTERACTIONS BETWEEN FELINE LEUKAEMIA VIRUS AND CELLS IN TISSUE CULTURE.

(E.) Lair, H. M. (Animal Leukaemia Res. Unit, U. Glasgow, Scotland), O. Jarret and J. M. Whalley. *Bibl Haematol* (39):133-138, 1973.

Feline embryonic cells and polyoma virus-transformed rat embryo cells grown in Eagle's medium with 10% fetal bovine serum were infected with feline leukemia virus. The virus induced viral replication in the cat cells but not in the rat cells. Virus uptake and virus-cell interactions in the cultures were examined during the 2-hr postinfection period. In both rat and cat cells, virus uptake occurred by pinocytosis, phagocytosis, and by direct entry through the cell surface. If one of the observed virus-cell interactions characterizes infection, the failure to detect replicating virus in the rat cells might indicate that rat cells provide a permissive but inefficient system for virus production. Alternatively, the virus-cell interaction which differentiates infection from nonspecific uptake did not occur during the 2-hr period or was so rare that it was not recorded.

3813 PROLIFERATION CAPACITY OF (CFU-s) CELL LINES FROM THE SPLEENS OF LEUKEMIC MICE WITH FRIEND'S LEUKEMIA.

(Fr.) Wendling, F. (Radium Inst., Orsay, France), P. Tambourin and P. Bucau-Varlet. *C R Acad Sci (D) (Paris)* 278:2385-2388, 1974.

The proliferation capacity of CFU cell lines from the spleens of mice with Friend's leukemia was studied, using subcutaneous grafting. No tumor was observed at the site of inoculation of the cells, while 70% of all animals died within 8 weeks, showing characteristic hepatosplenomegaly. The CFU cell line of mice with Friend's leukemia was found to be transplantable a limited number of times only in irradiated isogenic receptors. The cells transformed by Friend's virus were not therefore, transplantable either in irradiated animals or in intact isogenic receptors. Thus, Friend's splenomegaly results from the continuous transformation of target cells by the virus.

3814 GROSS VIRUS LEUKEMIA IN THE RAT: KINETICS OF INFECTION AND IMMUNITY. *(E.)*

Ioachim, H. L. (Lenox Hill Hosp., New York, N.Y.). *Bibl Haematol* (39):288-295, 1973.

Newborn and infant rats are highly susceptible to Gross leukemia virus (GLV), while mature rats are resistant and able to produce potent neutralizing antibodies. Regardless of strain, 123 mothers who received a single dose of GLV completely protected their offspring against a lethal dose of GLV administered in the first days of life. Protection from viral induction of leukemia was 65% in progeny of immunized mothers nursed by nonimmunized mothers, 89% in progeny of nonimmunized mothers nursed by immunized mothers, and 100% in the progeny born and nursed by immunized mothers. Indirect immunofluorescence showed that antibodies against GLV are naturally present in serum of adult rats although in low titers. The antibody titers were markedly increased by administration of Gross virus as well as by transplantation of Gross virus-carrying leukemic cells. Loss of viral expression was demonstrated in two lines of transplantable tumors derived from a rat thymus infected initially with GLV *in vitro*. Both tumors were entirely negative for the gs-1 group-specific antigen, whereas close to 100% of cells in the initial culture were intensely positive. Following explanting back in culture, all of five serially transplanted tumors became positive for the group-specific antigen. Although tumors and cultures were not extensively screened under the electron microscope, numerous viral particles were found in one culture while no particles were seen in any of the transplantable tumors. The possibility of temporary loss with subsequent recovery of the phenotypic expression of Gross leukemia virus genome, demonstrated in these experiments, supports the concept of vertically transmitted virogenes and oncogenes of C-type RNA tumor viruses.

3815 ALTERATION OF SKIN IN GROSS LEUKEMIA. V. REFUTATION OF VIRUS INVOLVEMENT. *(E.)*

Mariani, T. (Path. Lab. Med., U. Minnesota, Minneapolis) and Y. Maruyama. *J Natl Cancer Inst* 53(6): 1661-1664, 1974.

Previous experiments on the Gross passage A (GPA) virus-(C3H/Bi X DBA/2)F_1 mouse system showed that the tumor cell was more important in the process of syngeneic skin graft rejection than was the GPA virus. To determine the specific involvement of virus in this rejection, purified GPA in a cell-free filtrate form or in an irradiated cell-free ascites form was directly injected into newly placed grafts. One and a half yr after initial grafting and virus rejection, skin was exchanged between the treated group and normal animals to determine if antigens had been altered in the skin of the treated group. During the 2 1/2 yr-observation period, skin grafts were not rejected nor did graft-site tumors develop in any experimental animal, regardless of the source of the manner of introduction of virus. Eventually the animals died from disseminated GPA lymphoma. Though definitely leukemogenic, GPA virus seemed not to influence syngeneic skin rejection in this system.

3816 ASSOCIATION OF VIRUS IN RADIATION AND CHEMICAL LEUKEMOGENESIS IN RATS AND MICE. *(E.)*

Yorkoro, K. (Res. Inst. Nucl. Med. Biol., Hiroshima U., Japan), N. Imamura, H. Kajihara, M. Nakano and S. Takizawa. *Bibl Haematol* (39):603-616, 1973.

A comparative study of chemical and radiation leukemogenesis was carried out in mice and rats. C57BL/Ka and ICR/JCL mice given N-nitrosobutylurea in drinking water developed thymic lymphomas that showed significantly high cytotoxic indexes when incubated *in vitro* with antiserum against Gross virus-specific cell-surface antigen. Cell-free transmission of the NBU-induced C57BL thymic lymphoma cells resulted in the development of thymic lymphomas in syngeneic mice, either lymphomas or reticulum cell leukemia in Wistar/Fu rats, and Friend or Rauscher lesions in mice and rats. A leukemic cell-free supernatant from a rat thymic lymphomas elicited erythroblastic leukemia in Wistar/Fu and ACI rats and C57BL mice. Anti-Gross, but not anti-Rauscher leukemia, serum had a significant cytotoxic effect on cell-free transmitted Wistar/Fu rat leukemia cells. Following *in vitro* incubation with anti-Gross virus serum, the leukemic activity of cell-free supernatant from erythroblastic leukemia tissue was completely lost. Continuous administration of NBU to ICR/JCL mice brought about a sustained immunosuppressive state. These results imply that NBU leukemogenesis in mice is essentially mediated by Gross-type virus that has been harbored by the mice in dormant form. Both radiation and virus were necessary for induction of leukemia in young adult rats, which failed to develop the disease following the application of either agent alone. In mice, carcinogenic chemicals and radiation merely provide the favorable condition for interaction of Gross virus and its target cells, and proliferation of antigenically altered leukemic cells, most likely through their immunosuppressive effect on the host. The mechanism of leukemogenesis in the rat remains to be determined.

3817 FROG KIDNEY TUMORS INDUCED BY HERPESVIRUS CULTURED IN PRONEPHRIC CELLS. *(E.)*

Tweedell, K. S. (Dept. Biol., U. Notre Dame, Ind.) and W. Y. Wong. *J Natl Cancer Inst* 52(2):621-624, 1974.

A spontaneous renal adenocarcinoma (RT 208) removed from an adult *Rana Pipiens* (Vermont) after it was exposed to 9 C for 2.5 months was used as a source of herpesvirus. A mixed epithelioid cell line (WMPa)

erived from explants of pronephric kidneys of stage
5 *R. pipiens* embryos were used for culturing the vi-
us. Twentieth-passage pronephric cells infected
ith 3rd-passage virus were removed from culture
nd sonicated with a Willems Polytron sonicator at
2,000 rpm, 7300 cps for 2 min. The homogenate was
ractionated by centrifugation to yield a mitochon-
rial-viral fraction (P_2). A 10-fold dilution of
he P_2 fraction from infected WMPa cells was inocu-
ated in the amount of 0.2 µl into 30 stage 17 em-
ryos of *R. pipiens*, and the same quantity of P_2
raction from noninfected WMPa cells was injected
nto 26 control embryos. Metamorphosis began after
3 months. At this time, there were 23 survivors in
he infected group, of which 5 had carcinomas of the
idney. The first tumor was detected at 3 months,
and a total of 12 animals developed renal tumor by
the end of the 6th month. Seven of the tumors were
of the pronephros, and 5 additional tumors also
involved the mesonephric kidney. All tumors were
actively growing renal adenocarcinomas. Of 21 sur-
vivors from the control group given injections of
P_2 fraction from noninfected cells, none developed
tumors.

3818 REGULATION OF HERPESVIRUS MACROMOLECULAR SYNTHESIS: NUCLEAR RETENTION OF NONTRANSLATED VIRAL RNA SEQUENCES. *(E.)* Kozak, M. (Dep. Microbiol., Univ. Chicago, Ill.) and B. Roizman. *Proc Natl Acad Sci USA* 71(11):4322-4326, 1974.

Two instances of selective RNA transport during herpes simplex virus 1 infection of human epidermoid carcinoma (HEp-2) cells are reported. In the first, viral RNA transcripts derived from about 50% of the viral DNA accumulated in the nuclei of cells 3 hr after infection. However, only 40-42% of the DNA was presented in transcripts accumulating in both cytoplasm and polyribosomes. A more striking disparity in the distribution of transcripts between nuclei and cytoplasm occurred when viral infection was initiated and maintained for 7 hr in the absence of protein synthesis. In cycloheximide-treated cells, RNA complementary to 45-50% of the viral DNA accumulated in the nuclei, while transcripts derived from only about 10% of the DNA were detectable in the cytoplasm. The transcripts that were selectively transported from the nucleus to the cytoplasm in the presence of cycloheximide were functional messenger RNA molecules, as judged by their presence in polyribosomes after cycloheximide removal. The RNA selectively retained in the nucleus during the period of cycloheximide treatment did not accumulate in the cytoplasm even after protein synthesis resumed. These findings suggest that only viral transcripts competent to function in translation are exported from the nucleus.

3819 EXPRESSION OF THE VIRAL THYMIDINE KINASE GENE IN HERPES SIMPLEX VIRUS-TRANSFORMED L CELLS. *(E.)* Lin, S. S. (Roswell Park Mem. Inst., Buffalo, N.Y.) and W. Munyon. *J Virol* 14(5):1199-1208, 1974.

The expression of thymidine kinase (TK) was compared in normal and herpes simplex virus (HSV)-transformed L cells. In asynchronously dividing cultures of L cells, TK activity rose and declined rapidly and coordinately with DNA synthesis. When net cell increase stopped, TK activity was at a minimum. In contrast, TK activity of HSV-transformed cells remained at a minimum during rapid DNA synthesis and gradually increased as the rate of DNA synthesis decreased. When net cell increase stopped, TK activity was at a maximum. In synchronous cultures of L cells, TK activity rose and fell coordinately with the rate of DNA synthesis. In synchronous cultures of HSV-transformed cells, no increase in TK activity was observed during the period of rapid DNA synthesis, i.e., the S phase. These findings indicated that the viral TK genome in HSV-transformed cells was not placed under control of the cellular mechanisms which normally modulate the host cell TK gene. Lytic infection of HSV-transformed cells with a TK$^-$mutant of HSV-1 induced a 4- to 5-fold increase in viral TK. The TK of HSV-1 was induced in the HSV-1-transformed cells and HSV-2 in the HSV-2-transformed cells by this TK mutant. The same infection of normal L cells decreased the cellular activity by 80%. This stimulation, rather than inhibition, suggests that the viral gene in HSV-transformed cells retains some of its original viral characteristics.

3820 USE OF IMMUNE LYMPHOCYTES TO DETECT EXPRESSION OF HERPETIC GENOME. *(E.)* Sprecher-Goldberger, S. (Pasteur Inst. Brabant, Brussels, Belgium), L. Thiry and P. Vandenbussche. *Nature* 250(5468):678-679, 1974.

Attempts to transfer the nucleic acids of a Herpes simplex virus (HSV)-transformed cell line to normal cells, and to check whether functional viral nuclei had been transferred, by assaying recipient cells for herpetic antigen are discussed. Lymphocytes from hamsters immunized with HSV-2 transformed cells (333 line), or with UV-irradiated HSV-2 virions, were stimulated specifically by the transformed cells. Lymphocytes from hamsters immunized with HSV-2 grown in Hep-2 cells reacted with Hep-2 cells treated with nucleic acids from the transformed cells, but not with untreated Hep-2 cells. The immune lymphocytes also reacted with Hep-2 cells infected with either HSV-2 virions or HSV-2 DNA. A zone phenomenon was observed with nucleic acids from the transformed 333 cells in that Hep-2 cells treated with 0.1 µg nucleic acids were more responsive than those treated with 5 µg. The appearance of herpetic antigens in hamster C 13 cells was also demonstrated by the nucleic acid transfer method.

3821 INHIBITION OF HERPES VIRUS-INDUCED CELL FUSION BY CONCANAVALIN A, ANTISERA, AND 2-DEOXY-D-GLUCOSE. *(E.)* Ludwig, H. (Inst. Virol., Justus Leibig U., Giessen, W. Germany), H. Becht and R. Rott. *J Virol* 14(2):307-314, 1974.

Primary, subcultured, and permanent line rabbit kidney (RK) cells fused after infection with pseudorabies (PsR) virus. This kind of cytopathic effect was not observed in L-cells, BHK-cells, HeLa-cells, or primary bovine fetus cells. When Concanavalin A

(Con A) (15-25 μg/ml) was added to the culture medium 0-4 hr postinfection (pi), the PsR virus-infected cells did not fuse. The Con A-induced inhibition of cell fusion was prevented by addition of α-methyl-D-glycopyranoside (100 mM) to the medium containing the phytagglutinin. Con A (10-250 μg) did not agglutinate the PsR virus-infected cells, nor did it reduce the infectivity of the cell-free virus. Virus-specific antibodies also inhibited PsR virus-infected RK cell fusion, while a hyperimmune serum directed against virus structural components had no effect. 2-Deoxy-D-glucose reversibly disturbed the virus-induced fusion and significantly reduced virus infectivity. The results substantiate the suggestion that glycoproteins play a role in the alteration of the herpes virus-infected cell monolayer. The mechanism by which Con A and antibodies block fusion may be identical, either agent potentially acting by sterical interference of the cell-to-cell contact and, to some extent, by formation of a lattice at the cell membrane. The membrane would thus lose its normal flexibility and its ability to merge with a neighboring cell.

3822 DEMONSTRATION OF A RECEPTOR FOR IgG IN SYRIAN HAMSTER CELLS TRANSFORMED WITH HERPES SIMPLEX VIRUS.

(E.) Westmoreland, D. (Sir William Dunn Sch. Pathol., Oxford, England), J. F. Watkins and F. Rapp. *J Gen Virol* 25(1):167-170, 1974.

Several herpes simplex-transformed hamster cell lines were examined for the presence of the immunoglobulin G (IgG) receptor using two methods: confluent cultures of transformed cells were sensitized by incubation in rabbit anti-sheep erythrocyte serum then washed and reincubated with a suspension of sheep erythrocytes; and the binding of IgG by herpes-transfromed cells was measured directly using ^{125}I-labeled IgG. In the hemadsorption experiments, some lines showed no adsorption of erythrocytes, some showed adsorption to every cell, and some showed adsorption to only a few cells. In the latter group, the positive cells were often much larger than the negative cells and often had more than one nucleus or an irregularly shaped nucleus. No nuclear changes characteristic of herpes simplex lytic infection were noted. The results with ^{125}I-labeled IgG correlated well with the results of the hemadsorption experiments. All of the transformed cell lines bound more IgG than primary hamster embryo cells or those of the BHK-21 hamster cell line. The results support the view that herpes virus functions persist in the transformed cells. The presence or absence of the receptor for IgG may be of crucial importance in demonstrating that a given human tumor is caused by herpes simplex virus.

3823 DUAL INFECTION WITH ENDOGENOUS HERPES- AND C-TYPE VIRUSES IN CULTURED CELLS DERIVED FROM NORMAL AND LEUKEMIC GUINEA PIGS.

(E.) Hsiung, G. D. (Yale U. Sch. Med., New Haven, Conn.) and C. K. Y. Fong. *Proc Soc Exp Biol Med* 147:635-639, 1974.

Dual infection with endogenous herpes- and C-type viruses was observed in cultured cells (spleen, liver, and/or kidney) derived from normal guinea pigs. Single cells dually infected with both types of virus were also found; in general, the herpesvirus was in the nucleus and the C-type virus in the extracellular space. The guinea pig C-type virus was activated by maintaining the cultured cells in medium containing 5-bromo-2'-deoxyuridine and was detected in all guinea pigs tested, regardless of age, strain, or source. The number of cells carrying the C-type virus was greater in cultures obtained from embryos and young guinea pigs than from adults. Manifestation of the herpesvirus required prolonged cultivation of the cells or cocultivation with susceptible monolayer cultures. The herpesvirus isolation was age and strain dependent; it occurred most frequently in older inbred animals. Recognition of these two endogenous viruses in normal guinea pig is significant in view of the thousands of guinea pigs used yearly for biomedical research, especially for immunological studies.

3824 STIMULATION OF *HERPESVIRUS SAIMIRI* EXPRESSION IN THE ABSENCE OF EVIDENCE FOR TYPE C VIRUS ACTIVATION IN A MARMOSET LYMPHOID CELL LINE.

(E.) Neubauer, R. H. (Litton Bionetics, Inc., Kensington, Md.), W. C. Wallen and H. Rabin. *J Virol* 14(4):745-750, 1974.

Nucleic acid base analogues were used to examine a *Herpesvirus saimiri* (HSV)-infected marmoset lymphoid cell line (MLC-1) for possible association with type C viruses. Cell-free tissue cultures were concentrated 100-fold by ultracentrifugation and examined for the presence of an RNA-directed DNA polymerase with a preference for synthetic templates characteristic of type C virus. HSV was monitored by immunofluorescence for early, late, and membrane antigens. MLC-1 cells were exposed to 5-bromo-2'-deoxyuridine (BUdR, 30 μg/ml) for 24 hr, 5-iodo-2'-deoxyuridine (IUdR, 20 μg/ml) for 30 hr, or IUdR for 3 days followed by 2% dimethyl sulfoxide for 4 days. Results of these experiments failed to show any type C virus-like polymerase; however, HSV expression was greatly stimulated. BUdR and IUdR enhanced expression of HSV-associated antigens 5- to 7-fold, with maximum stimulation observed 3-4 days after removal of the analogue. IUdR-dimethyl sulfoxide treatment was generally less effective. Although more cells showed HSV antigens, the treatments did not increase cell-free infectious virus. The data suggest that HSV-infected lymphoid cells can be stimulated to express virus in a manner similar to that of the Epstein-Barr virus in Burkitt's lymphoma cells. No evidence of type C virus was found in stimulated cultures.

3825 *HERPESVIRUS SAIMIRI:* VII. INDUCTION OF MALIGNANT LYMPHOMA IN NEW ZEALAND WHITE RABBITS.

(E.) Daniel, M. D. (Harvard Med. Sch., Southboro, Mass.), L. V. Melendez, R. D. Hunt, N. W. King, M. Anver, C. E. O. Fraser, H. Barahona and R. B. Baggs. *J Natl Cancer Inst* 53(6):1803-1807, 1974.

New Zealand White rabbits were inoculated (i.v., i.p., s.c., i.m., or intradermally) with 0.5 or 1 ml *erpesvirus saimiri* or squirrel monkey heart isolate, closely related *H. saimiri* strain. Of the 26 rabits studied, 3 died of cardiac tamponade, one on lay 14, one on day 26, and one on day 52 postinoculation. Of the remaining 23 rabbits, 12 (52%) died of malignant lymphoma between days 17 and 149. A single inoculation was sufficient to induce malignant lymphoma; multiple inoculations or routes were not required. Microscopically, the lymphoma was lymphocytic in eight and lymphoblastic in four cases. Both light and electron microscopy revealed a close resemblence between these rabbit lymphomas and *H. saimiri*-induced lymphomas in monkeys: the neoplastic infiltrate consisted of many round-to-oval cells, each with a large, centrally located nucleus surrounded by scant-to-moderate cytoplasm. The nuclei contained considerable heterochromatin and often a prominent nucleolus. Multiple injections of heat- or β-propiolactone-inactivated virus and complete Freund adjuvant did not elicit an immune response.

3826 A COHORT STUDY OF CANCER FOLLOWING INFECTIOUS MONONUCLEOSIS.

(E.) Connelly, R. R. (Natl. Cancer Inst., Bethesda, Md.) and B. W. Christine. *Cancer Res* 34(5):1172-1178, 1974.

Reports of 4529 cases of infectious mononucleosis diagnosed during the years 1948-1964 among residents of Connecticut were identified through existing records and matched against a register of cancer cases covering the same population. The overall cancer risk following infectious mononucleosis was increased with 33 cancers observed compared to 24.4 expected for a relative risk of 1.4. Although this increased cancer risk was not large and may easily have occurred by chance, larger relative risks were found for certain forms of cancer, particularly malignant lymphomas (7 observed, 1.9 expected, relative risk = 3.7). The most provocative finding of this study was that five cases of Hodgkin's disease developed subsequent to infectious mononucleosis.

3827 DNA CONFIGURATION IN THE CORE OF MAREK'S DISEASE VIRUS.

(E.) Nazerian, K. (Agric. Res. Serv., Reg. Poultry Res. Lab., East Lansing, Mich.). *J Virol* 13(5):1148-1150, 1974.

This study describes the fine structure of Marek's disease virus (MDV) core and the possible spatial configuration of the virus DNA. It also presents a model of the herpesvirus core structure. Selected MD virions with clear morphology of the core were studied. In the electron micrographs the core of MDV is composed of an electron-opaque torous and a less electron-opaque structure that grew through the middle of the torous and connects the two inner poles of the capsid. The torous is usually located in the center and is perpendicular to the axis of the less dense filamentous structure. However, it can be shifted toward one of the poles and also be oblique to the axis of the central filamentous structure. A diagram of the spatial structure of the herpesvirus core is presented. The DNA molecule is seen as wound around a central structure, possible protein in composition, and is not randomly coiled within the capsid. The central structure is clearly connected to the inner poles of the capsid and may have a physical function and provide mechanical support for an orderly winding of the double-stranded DNA molecule. The low frequency of virions with this morphology is expected considering the spatial configuration of the core within the capsid. Particles with this type of core may represent a development stage of the herpes virion.

3828 PLAQUE ASSAY FOR THE MASON-PFIZER MONKEY VIRUS.

(E.) Rand, K. H. (Stanford U. Hosp., Calif.), C. W. Long, T. T. Wei and R. V. Gilden. *J Natl Cancer Inst* 53(2):449-452, 1974.

A syncytial plaque assay for the Mason-Pfizer monkey virus (MP-MV) was developed using the KC cell line, a human malignant glioma cell line transformed by Rous sarcoma virus. On cocultivation of MP-MV-infected and KC cells, syncytia with as many as 40-50 nuclei/cell developed within 24 hr. In heavily infected cultures, the syncytia were essentially confluent, with discrete plaques of 3-8 syncytia forming at the higher dilutions. The syncytial plaques were seen against a background of normal KC cells. By focal assay, immunodiffusion, and complement fixation, this plaque assay appears to be as sensitive as the measurement of the viral RNA-dependent DNA polymerase in the culture fluid or of viral antigens. Since the KC cells also form extensive syncytia in response to the RD-114 virus and to β-propiolactone-inactivated Sendai virus, the assay has only relative specificity for both MP-MV and RD-114. The mechanism of syncytial formation induced by the MP-MV appears to be similar to that of the RD-114-induced fusion of KC cells.

3829 THE VIRAL ENVELOPE GLYCOPROTEIN OF MURINE LEUKEMIA VIRUS AND THE PATHOGENESIS OF IMMUNE COMPLEX GLOMERULONEPHRITIS OF NEW ZEALAND MICE.

(E.) Yoshiki, T. (New York Hosp. Cornell U. Med. Coll., New York), R. C. Mellors, M. Strand and J. T. August. *J Exp Med* 140(4):1011-1027, 1974.

Monospecific antisera were used in the radioimmunoassay and immunofluorescence study of two major viral proteins (gp69/71 and p30) of murine leukemia virus. These proteins may be of significance in the pathogenesis of immune complex glomerulonephritis in mice, particularly NZB and B/WF$_1$ hybrid mice. A remarkably high concentration of viral envelope glycoprotein, gp69/71, was detected in the spleens and sera of New Zealand mice (NZB, NZW, B/WF$_1$, and W/BF$_1$); the concentration in the spleen was 10-fold greater than that found in AKR mice and 30-fold greater than that present in C57BL/6 mice. The gp69/71 was deposited along with bound immunoglobulins, apparently as an immune complex, in the diseased kidneys of mice, and the glomerular site and extent of deposition of gp69/71 was related to the severity of the glomerulonephritis. The data suggest that the pathogenesis of immune complex glomerulonephritis (and vasculitis) in mice is related to the expression of this specific viral envelope glycoprotein and to the host immune response to this protein.

3830 STRUCTURAL COMPONENTS OF A MURINE LEUKEMIA VIRUS AND THE PLASMA MEMBRANE OF VIRUS INFECTED CELLS.

(E.) Panem, S. (Dept. Path., U. Chicago, Ill.), S. A. Schwartz and W. H. Kirsten. *Bibl Haematol* (39):281-287, 1973.

Rat RBC membranes were infected with purified murine erythroblastosis virus (MEV) labeled with ^{14}C-amino acids and ^{3}H-glucosamine. After polyacrylamide gel electrophoresis, proteins were stained with coomassie blue and carbohydrates with periodic acid-Schiff stain (PAS). Coelectrophoresis of labeled MEV proteins yielded 16 reproducible polypeptide and glycopeptide components. The gel could be roughly divided into two halves, slices 1-49 and slices 50-85. In the first half 40% of the amino acid label and 95% of the glucosamine label migrate; in the second half 60% of the amino acid label and 5% of the glucosamine label migrate. The great majority of glycopeptides migrate in the first half where polypeptides greater than 40,000 daltons are expected to run. That some of the glycoproteins are located in the viral envelope was suggested by a decrease of stained material in the first half of the gels containing viral nucleoid proteins, as compared with gels of whole viral proteins. The first half of infected RBC gels showed a 20% increase in protein content when compared with controls. All PAS bands were increased in infected cells, which also exhibited a 50% increase in sialic acid content as measured by the thiobarbituric acid method. This increase was not due to the presence of viral glycoproteins.

3831 *IN VITRO* ASSOCIATION OF UNIQUE SPECIES OF CELLULAR 4S RNA WITH 35S RNA TUMOR VIRUSES.

(E.) Waters, L. C. (Carcinogenesis Program, Oak Ridge Natl. Lab., Tenn.), B. C. Mullin, T. Ho and W. K. Yang. *Biochem Biophys Res Commun* 60(2):489-497, 1974.

Cellular 4S RNA was isolated from AKR murine leukemia virus, purified, radiolabeled, and hybridized with AKR 35S or 70S RNA. Sucrose gradient analysis indicated that in the presence of AKR viral 70S RNA, a small amount of the tritiated AKR cell 4S RNA sedimented in the 35S and higher region of the gradient; in the absence of viral RNA, no radioactivity appeared in this region. Essentially identical results were obtained using AKR 35S viral RNA, except that the radioactivity peaked much more sharply in the 35S region. An increase in radioactivity at the bottom of the gradient was seen with 70S viral RNA but not with isolated 35S RNA. RPC-5 column chromatography of the 4S RNA which associated with the viral 35S RNA showed it to be distinctly different from the total cellular 4S RNA. A major RNA component associated with 70S RNA *in vivo* cochromatographed with the main component which associates with viral 35S RNA *in vitro*. AKR cellular 4S RNA also associated *in vitro* with avian myeloblastosis virus (AMV) 35S RNA, the main component of which cochromatographed with that which associates with AKR 35S RNA. The minor components were generally not coincident. A significant proportion of the RNA associating with both AKR and AMV 35S RNAs did not elute in the region of most 4S RNA; this proportion increased as the quality of the input 4S RNA decreased. The bulk of this material was probably degraded messenger RNA.

3832 EVIDENCE FOR A STABLE INTERMEDIATE IN LEUKEMIA VIRUS ACTIVATION IN AKR MOUSE EMBRYO CELLS.

(E.) Ihle, J. N. (Carcinogenesis Program, Oak Ridge Natl. Lab., Tenn.), F. T. Kenney and R. W. Tennant. *J Virol* 14(3):451-456, 1974.

The requirement for serum in the activation of the endogenous leukemia virus expression in AKR mouse embryo cells by 5-iododeoxyuridine (IdURD, 100 µg/ml for 24 hr) was studied by immunofluorescent techniques. To determine if activation required two cell cycles, the ability of IdURD to activate virus expression was examined at various times after removal of serum. In all cultures, IdURD was left on the cells for 24 hr and then removed, and the cells allowed to recover in medium with or without serum. In the presence of serum, the ability of IdURD to activate virus expression roughly paralleled the ability of cells to synthesize DNA (and thus incorporate IdURD) after the removal of serum. Cells allowed to recover in the absence of serum expressed viral antigens only when IdURD was added immediately at time of serum removal. These results confirmed that incorporation of IdURD is required for activation and suggested that a second cell cycle, unrelated to IdURD incorporation, is necessary to initiate virus expression. These observations also indicated the existence of a stable activation intermediate that subsequently will initiate virus expression after readdition of serum. This intermediate was demonstrated by the virus expression observed when serum was restored to cells allowed to recover for 48 hr in the absence of serum following IdURD treatment. The molecular nature of the activation intermediate is not known, but it appears to be comparable to the provirus formed after infection of avian and mouse cells with exogenous oncornavirus.

3833 NONSPECIFIC ANTIVIRAL SUBSTANCES IN HUMAN MILK ACTIVE AGAINST ARBOVIRUS AND MURINE LEUKEMIA VIRUS.

(E.) Fieldsteel, A. H. (Stanford Res. Inst., Menlo Park, Calif.). *Cancer Res* 34(4):712-715, 1974.

Forty-three individual human milk samples obtained 2 weeks to 17 months postpartum were divided into five large pools. These plus three large individual human milk samples obtained 2 and 5 months postpartum were tested for antiviral activity against Japanese B encephalitis virus, Friend leukemia virus, and Rauscher leukemia virus by a standard neutralization test. All milk samples had a high degree of antiviral activity against the three viruses. The bulk, if not all, of the antiviral activity appeared to be in the cream fraction and was remarkably heat stable. Heating the milk to temperatures up to 100 C for 30 min had no effect upon its ability to destroy the infectivity of Japanese B encephalitis virus for Swiss-Webster mice or inhibit the ability of Friend leukemia virus to induce splenomegaly in BALB/c mice.

834 INHIBITION OF RNA DIRECTED DNA POLYMERASE OF MURINE LEUKEMIA VIRUS BY 2'-O-ALKYLATED OLYADENYLIC ACIDS. *(E.)* Arya, S. K. (Roswell Park Mem. Inst., Buffalo, N.Y.), W. A. Carter, J. L. Alderfer and P. O. P. Ts'o. *Biochem Biophys Res Commun* 59(2):608-615, 1974.

The effect of polyadenylic acids on DNA polymerase was studied. Poly(2'-O-alkyl)adenylic acids strongly inhibited the RNA-directed DNA polymerase of murine leukemia virus but had no significant effect on the activity of *E. coli* and murine spleen DNA polymerase. Poly(2'-O-methyl A) and poly(2'-O-ethyl A) showed an apparent competitive inhibition of poly(A): oligo-(dT)-directed MLV polymerase. Poly(A), poly-(2'-O-methyl A), poly(2'-O-ethyl A), and poly(dA) yielded kinetics of inhibition of poly(C):oligo-(dG)-directed MLV polymerase which were inconsistent with a simple competitive inhibition with respect to the template. Strength of inhibition decreased in the following order: poly(I) > poly(2'-O-ethyl A) > poly(2'-O-methyl A) for the poly(A):oligo(dT)-directed reaction; and poly(2'-O-ethyl A) > poly-(2'-O-methyl A) > poly(A) >> poly(dA) for the poly(C): oligo(dG)-directed reaction. Thus, O-alkylation of the 2'-hydroxy group of poly(A) increases its inhibitory potential for viral DNA polymerase.

3835 HIGH RESOLUTION ELECTRON MICROSCOPY STUDIES OF MURINE LEUKEMIA VIRUSES. *(E.)* De Harven, E. (Sloan-Kettering Inst. Cancer Res., New York, N.Y.) and T. Sato. *Bibl Haematol* (39):296-306, 1973.

High-resolution electron microscopy of murine leukemia viruses from chronically infected cultures confirmed that varied proportions of two distinct structural types of virus particles ('enveloped A' and 'C') are present in Friend leukemia virus, Rauscher leukemia virus, Moloney leukemia virus, Moloney sarcoma virus, and Gross leukemia virus. The 'enveloped A' particles contain an unidentified granular component and their viral core is composed of two closely associated concentric shells. The viral envelope is the only membrane structure seen in 'enveloped A' and 'C' particles. Type C particles show a decreased level of structural organization of the viral core, the viral envelope remaining unchanged. Intracisternal particles are clearly distinguishable from both 'enveloped A' and 'C' particles, in part by the intimate contact between viral envelope and viral core and also by budding along rough endoplasmic reticulum membranes. The murine leukemia viruses frequently incorporated cytoplasmic ribosomes during the budding process. Observations on virus phagocytosis were negative. In chronically infected systems, the infection is apparently transmitted by mitosis *via* the chromosomes of the infected cells, with release of particles by budding from cell surfaces of little significance in the maintenance of the infectious state. Electron microscopy of human ESP-1 cells indicated that practically all viruses released by these cells have the morphology of 'enveloped A' and not that of type C particles.

3836 CHARACTERIZATION OF THE 5'-TERMINUS OF MURINE LEUKEMIA VIRUS RNA. *(E.)* Frank, J. J. (Baltimore Cancer Res. Ctr., Md.), R. G. Dorr and C. C. Levy. *Biochim Biophys Acta* 366(3):353-357, 1974.

The terminal nucleotides of 70 S RNA extracted from murine leukemia virus (AKR, L-1 strain MLV) were characterized by the introduction at the 5'-terminus of ^{32}P and by chemical conversion of the 3-terminal sugar residue to a tri[^{3}H]-alcohol. Identification of the ^{32}P- and ^{3}H-labeled products after alkaline digestion of the RNA established uridine and adenosine as the 3'- and 5'-terminal nucleosides, resp.

3837 IMMUNOPATHOGENICITY AND ONCOGENICITY OF MURINE LEUKEMIA VIRUSES: I. INDUCTION OF IMMUNOLOGIC DISEASE AND LYMPHOMA IN (BALB/c X NZB)F_1 MICE BY SCRIPPS LEUKEMIA VIRUS. *(E.)* Croker, B. P., Jr. (Scripps Clin. Res. Fdn., La Jolla, Calif.), B. C. Del Villano, F. C. Jensen, R. A. Lerner and F. J. Dixon. *J Exp Med* 140(4):1028-1048, 1974.

A systemic lupus erythematosus (SLE)-like syndrome and lymphoma can be induced in immunologically normal (BALB/c X NZB)F_1 mice by infection of neonates with a murine leukemia virus (MuLV) isolated from NZB lymphoblasts. Scripps leukemia virus (SLV 60A) was titered *in vitro* (XC test) and administered to newborn and adult (BALB/c X NZB)F_1 mice over six $\log_{10}$ dilutions. Propagation of MuLV in the newborn recipients was indicated by greatly elevated serum Mu gs-1 levels, which were proportional to the dose of virus given. The SLE-like syndrome was characterized by antinuclear antibodies (ANA) and immune complex-type glomerulonephritis. ANA production was related to the dose of virus and reached the highest levels at 8-16 wk. The incidence of glomerulonephritis was also correlated with the dose of virus and reached nearly 50% in the animals given the highest dose. Both the titers of ANA and the incidence of glomerulonephritis were greater in females than in males, although the amounts of Mu gs-1 in the sera of both sexes were equal. The incidence of direct Coombs' positivity was not significantly affected by inoculation of this virus. The incidence and time of onset of thymocytic lymphoma were linearly related to the amount of virus inoculated. High serum Mu gs-1 levels predicted lymphoma development and reflected increases in the amount of infectious virus in the spleen. No induction of tumors, autoimmunity, or high serum Mu gl-1 levels followed the administration of SLV 60A to 6-wk-old (BALB/c X NZB) F_1 mice or of inactivated 60A or active AKR virus to newborns.

3838 ULTRASTRUCTURE OF TUMORS INDUCED IN MICE BY MOLONEY AND HARVEY STRAINS OF MURINE SARCOMA VIRUS. *(E.)* Papadimitriou, J. M. (Dept. Pathol., U. Western Australia, Perth), D. J. McCully and P. J. Simons. *J Natl Cancer Inst* 53(3):829-835, 1974.

The ultrastructure of neoplasms induced in neonatal Prince Henry mice by the Harvey (MSV-H) and Moloney

(MSV-M) strains of murine sarcoma virus (10^4 focus-forming u of MSV/ml, i.m.) was examined. Although inflammatory cells and multinucleated giant cells were found in neoplasms induced by both strains, they were more frequent in those produced by MSV-M. A preponderance of abnormal vascular channels, large irregular periendothelial cells, and mesenchymal cells resembling the perivascular cells of developing blood vessels characterized neoplasms induced by MSV-H. Both periendothelial and mesenchymal cells were detected in MSV-M-induced neoplasms, but they lacked the structural irregularities found in similar cells in tumors produced by MSV-H. Differentiation toward striated skeletal muscle was not found in these cells. C-type virus particles budded from mesenchymal cells in all neoplasms, but intracisternal A-type particles were much more frequent in striated muscle cells of animals inoculated with MSV-M. In this experimental system, a malignant transformation of both endothelial and periendothelial cells appeared to occur in neoplasms induced by MSV-H, whereas MSV-M inoculation resulted in transformation of only periendothelial mesenchymal cells.

3839 REVERTANTS OF MOUSE CELLS TRANSFORMED BY MURINE SARCOMA VIRUS. III. METASTABLE EXPRESSION OF VIRUS FUNCTIONS IN REVERTANTS RETRANSFORMED BY MURINE SARCOMA VIRUS. *(E.)* Fischinger, P. J. (Natl. Cancer Inst., Bethesda, Md.), S. Nomura, N. Tuttle-Fuller and K. J. Dunn. *Virology* 59(1): 217-229, 1974.

Mouse 3T3FL cells transformed by the Moloney murine sarcoma virus (MSV) (sarcoma positive, leukemia negative, S+ L- cells) segregate spontaneous flat revertants. These S-L- revertants do not release MSV upon superinfection with murine leukemia virus (MuLV) but are susceptible to a second cycle of single-hit MSV transformation. The behavior and nature of second-cycle MSV transformed revertants were followed by successive clonal generations. The second transformation by MSV resulted in a number of metastable states. Of these the general phenomenon of changeability from S+ ⇄ S- or L- ⇄ L+ was striking. Observations on the metastable types are compatible with the interpretation that the second cycle of MSV transformation destabilizes cellular controls over the transforming genome.

3840 VIRAL RNA OF MURINE SARCOMA VIRUS PRODUCED BY A HAMSTER-MOUSE SOMATIC CELL HYBRID. *(E.)* Tsuchida, N. (Flow Labs., Inc., Rockville, Md.), C. Long and M. Hatanaka. *Virology* 60(1):200-205, 1974.

The viral RNA genome of murine sarcoma virus synthesized by a hybrid cell line, THR-23 (isolated by Sendai virus fusion of a hamster cell (HT-1) carrying the defective Moloney sarcoma genome and Swiss mouse cells shedding Rauscher leukemia virus) was characterized. The THR-23 line produced a 500-fold excess of sarcoma over leukemia virus. The high molecular wt RNA from the virions of THR-23 gave a single peak in sucrose gradients with a sedimentation coefficient of 60S; this is smaller than that of the Rauscher murine leukemia virus (70S). The 60S RNA of THR-23 dissociated to a 30S subunit RNA after heat denaturation. The size differed from that of the 35S subunit RNA of 70S Rauscher leukemia virus RNA. 30S intracellular virus-specific subunit RNA was detected in HT-1 and THR-23 cells by hybridization with the DNA product produced *in vitro* from Moloney murine sarcoma and leukemia viruses. These results suggest that the defective genome (30S RNA) of the HT-1 cell is synthesized in the THR-23 hybrid cell, aggregated to 60S viral RNA, and incorporated into the virion. In contrast to the avian system, the murine sarcoma genome appears smaller when determined by sedimentation than the murine leukemia genome.

3841 FRIEND VIRUS RELEASE AND INDUCTION OF HAEMOGLOBIN SYNTHESIS IN ERYTHROLEUKAEMIC CELLS RESPOND DIFFERENTLY TO INTERFERON. *(E.)* Swetly, P. (Ernst-Boehringer Inst. Pharm. Res., Vienna, Austria) and W. Ostertag. *Nature* 251(5476):642-644, 1974.

Interferon treatment inhibits the release or replication of virus particles in treated cells but does not interfere with DMSO-induced differentiation. No interferon could be detected in the supernatants FSD1/F4 erythroleukemic cells or those of two other spleen focus forming virus (SFFV)-transformed cells during proliferation in the presence or absence of DMSO. Thus, Friend virus (FV) does not trigger the interferon response in these cells. When mouse interferon was added to FSD1/F4 cells *in vitro,* there was more than a 100-fold reduction in spleen focus formation by the cellular supernatants and in uridine label in the C-type particles within the cells. Heterologous chicken interferon did not reduce the virus yield. The growth rate of the cells treated with mouse interferon was only slightly reduced. In DMSO-treated cells, virus synthesis was reduced below background levels, but differentiation and globin synthesis were not altered. The degree of purity of the interferon had no effect on its action. The data indicate that the release of Friend virus is not required for the *in vitro* erythroid differentiation of these cells.

3842 MORPHOLOGY OF TYPE C ONCORNAVIRUSES IN A CONTINUOUS CELL LINE OF MONKEY SARCOMA AR-1. *(Rus.)* Martynenko, V. B. (N. F. Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR). *Vopr Virusol* (1):89-91, 1974.

Electron microscope studies of oncornaviruses in a continuous cell line of AR-1 monkey sarcoma revealed extracellular clusters of type C virions of spherical or oval shape, measuring 81-83 x 54-56 nm. Tumor cells were grown as monolayers in Carrel dishes in Eagle's medium containing 10% bovine serum. The oval-shaped 50-52 x 31-32 nm nucleoid was located in the central part of the virion. Nascent virions were also observed near the cytoplasmic membranes. These findings indicate that in the cells of the continuous line of AR-1 sarcoma there persists a virus morphologically similar to type C oncornavirus.

3 COMMON ANTIGENS IN ONCORNAVIRUSES FROM CON-
TINUOUS HUMAN CELL LINES AND MASON-PFIZER
US. *(E.)* Irlin, I. S. (N.F. Gamaleya Inst. Epi-
iol. Microbiol., Moscow, USSR), K. V. Ilyin,
F. Bykovsky, G. G. Miller, M. Y. Volkova, T. F.
zinsky and V. M. Zhdanov. *Intervirology* 2(2):95-
, 1973/1974.

tracellular antigens were prepared from extracel-
lar viruses isolated from human HEp2, HeLa, DAPT,
, Detroit 6, AO, and Al cells. Immune sera against
son-Pfizer monkey virus (MPMV) and HEp2 virus formed
entical precipitation lines with antigens of
p2, Detroit 6, and RH cells in immunodiffusion
sts. In immunodiffusion reactions with autoradio-
aphy, MPMV serum reacted with RH cell antigen but
t mouse mammary tumor virus (MMTV) antigen, while
TV serum reacted with MMTV antigen but not RH cell
tigen. MPMV serum reacted with homologous viral
tigens. Both MPMV and HEp2 sera reacted with cel-
lar and extracellular antigens from HEp2, HeLa,
PT, RH, Detroit 6, AO, and Al cell cultures, as
ell as with MPMV antigens. Neither MMTV-related
tigens nor gs3 antigen of the C-type viruses were
vealed in these cultures. Thus, these 7 human
ltures, all of which produce B-type oncornaviruses,
ntain both extracellular and intracellular antigen
ich is closely related to the antigen of MPMV.

844 THE TYPE OF ONCORNAVIRUS PARTICLES WHICH
PERSIST IN J-96 LYMPHOBLASTOID CELLS. *(Rus.)*
olov'ev, V. D. (Ctr. Inst. Postgrad. Med., Moscow,
SSR), A. F. Bocharov, G. A. Delimbetova, B. V. Gush-
hin, S. M. Klimenko and V. M. Zhdanov. *Vopr Virusol*
6):736-738, 1973.

-96 cells were first isolated in 1955 from the blood
f a patient with subacute lymphatic leukemia. Since
969, electron microscope studies of the cells have
egularly revealed persistent type A and C oncorna-
viruses. Between 1972-1973 either type C or B virions
were observed in J-96 cells, with type A present in
both the cells and culture medium. So far there is
no evidence of all three types being present in a
single cell. It is suggested that the three types
of virions are manifestations of one oncornavirus
genome in different stages of replication. It is
also possible that a combination of viruses, includ-
ing a virus helper, is involved as has been observed
with murine viruses belonging to the leukemia-sarcoma
group.

3845 THE FORMATION OF TYPE A ONCORNAVIRUS IN THE MITOCHONDRIA OF CELL CULTURES FROM HAMSTER TUMORS INDUCED BY ROUS SARCOMA VIRUS. *(Rus.)* Gorokhova, L. V. (N. F. Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR). *Vopr Virusol* (5):607-609, 1973.

Electron microscope examination of cell cultures from hamster tumors induced by Rous sarcoma virus (Carr-Silber strain) revealed that type A virions and developing nucleocapsids were present in the mitochondria. The virions measured 800-900 Å in diameter and were located in cavities of the cristae and between the inner and outer membranes of the mitochondria. The nucleocapsids, whose membranes apparently developed from membranes of the cristae and the inner mitochondrial membranes, were electron-dense rings 100-150 Å thick, in the center of which were lighter zones 280-320 Å in diameter. Nucleocapsids also occurred in the hyaloplasm, immediately adjacent to the mitochondria. Components of the outer mitochondrial membrane are probably involved in the formation of membranes of virions developing from these nucleocapsids. In cells containing virions, the space between mitochondrial membranes decreased, there were fewer cristae, and the cristae were more fragmented than in intact cells. Virion formation occurred by budding through the cell membrane. These findings confirm that oncornavirus genomes can form in mitochondria.

3846 COMPARISON OF JC AND BK HUMAN PAPOVAVIRUSES WITH SIMIAN VIRUS 40: RESTRICTION ENDONUCLEASE DIGESTION AND GEL ELECTROPHORESIS OF RESULTANT FRAGMENTS. *(E.)* Osborn, J. E. (U. Wisconsin Med. Sch., Madison), S. M. Robertson, B. L. Padgett, G. M. Zu Rhein, D. L. Walker and B. Weisblum. *J Virol* 13 (3):614-622, 1974.

The JC virus, isolated from primary human fetal glial cell cultures, has a buoyant density of 1.20 g/cm^3 in linear sucrose-D_2 and 1.35 g/cm^3 in cesium chloride isopycnic gradients. DNA extracted from JC-infected cultures or from gradient-purified virions occupied a dense portion relative to linear DNA in cesium chloride/ethidium bromide gradients, and the circular configuration of the extracted DNA was confirmed by electron microscopy, with a measured molecular wt of 2.93×10^6. DNA from BK virus, another human papovavirus, was similarly prepared and compared with JC and a simian virus 40 (SV40) standard by digestion with restriction endonuclease preparations from *Haemophilus influenzae, Haemophilus parainfluenzae,* and *Escherichia coli*. Electrophoretic analysis of the digests polyacrylamide slab gels or agarose gels showed that the three viruses had distinctly different cleavage patterns by this form of analysis: JC and BK viruses were almost entirely different from SV40 and significantly different from each other. Thus, the JC and BK human papovaviruses appear to be discrete new members of the papovavirus group, rather than SV40 variants.

3847 CHARACTERIZATION OF PAPOVAVIRUS- AND PICORNAVIRUS-LIKE PARTICLES IN PERMANENT PIG KIDNEY CELL LINES. *(E.)* Tischer, I. (Robert Koch Inst., Berlin, Germany), R. Rasch and G. Tochtermann. *Zentralbl Bakteriol* [*Orig A*] 226(2):153-167, 1974.

Uninoculated cultures of the permanent pig kidney cell line PK 15 of different origin were found to be infected with 2 kinds of viruses. One kind, a small spherical virus morphologically similar to picornavirus, had particles of mean diameter 170 Å and containing RNA. Because of its buoyant density and relatively high structural thermostability, it was more similar to rhinoviruses than to enteroviruses. The second virus had papovavirus-like particles of mean diameter 405 Å. They band at density 1.32 g/cm^3 in CsCl, and have no hemagglutinating ability. The virus is serologically unrelated to simian virus 40, K virus, and polyoma virus. Neither virus multiplies in primary fetal pig kidney cells, primary rhesus monkey kidney cells, or in BHK 21 cell cultures. The small picornavirus-like particles were regularly found in all PK 15 sublines and in every passage. The papovavirus-like particles were regularly observed in only 2 sublines of PK 15 cells during 40 passages. In later passages papovavirus-like particles were not produced or only sporadically in low amounts. Cells of these cultures and of the PK 15 lines where papovavirus production had not been noted revealed colony-forming ability when grown in semisolid agar suspension. This is indicative for a cell transformation that is presumed to be caused by the papovavirus-like particles. However, tests for oncogenicity of this virus in Syrian hamsters gave negative results. The origin of both types of virus is unknown. These results indicate once more the necessity for a thorough inspection of permanent cell cultures for containing virus particles or virus-induced transformation of the cells before their use for virus production or in virus research.

3848 COMPARISON OF TWO HUMAN PAPOVAVIRUSES WITH SIMIAN VIRUS 40 BY STRUCTURAL PROTEIN AND ANTIGENIC ANALYSIS.

(E.) Mullarkey, M. F. (Natl. Inst. Allergy Infect. Dis., Bethesda, Md.), J. F. Hruska and K. K. Takemoto. *J Virol* 13(5):1014-1019, 1974.

The proteins of simian virus 40 (SV40) and two human papovaviruses, the hemagglutinating BK virus and the nonhemagglutinating DAR virus, were analyzed and compared by sodium dodecyl sulfate polyacrylamide gel electrophoresis. The virions of SV40 and DAR contain seven proteins, the constituent proteins of these two viruses being identical by molecular wt analysis. Approximately 84% of the viral protein of each has a molecular wt of 45,000. The major protein of BK virus is 3000-5000 daltons lighter than the major proteins of the SV40 and DAR viruses. The five most rapidly migrating proteins of the BK virus are indistinguishable by molecular wt analysis from the corresponding proteins of the SV40 and DAR viruses. Radial immunodiffusion and immunoelectrophoresis of whole virus demonstrated lines of identity between SV40 and DAR when reacted with SV40 antibody. SV40 antiserum tested against BK virus showed no reactivity by complement fixation, immunodiffusion, or immunoelectrophoresis; similar results were obtained with BK antiserum tested against SV40. Since SV40, DAR, and BK viruses all induce similar T antigens, these data suggest that regions of homology and difference may exist in the nucleic acids of SV40 and BKV.

3849 *IN VITRO* POLYOMA DNA SYNTHESIS: CHARACTERIZATION OF A SYSTEM FROM INFECTED 3T3 CELLS.

(E.) Hunter, T. (Salk Inst., San Diego, Calif.) and B. Francke. *J Virol* 13(1):125-139, 1974.

A lysate from hypotonically swollen polyoma-infected BALB/3T3 cells incorporated labeled deoxynucleotide triphosphates into both viral and cellular DNAs. ATP, deoxynucleotide triphosphates, thiols, and magnesium ions stimulated the incorporation. Thiol reagents and arabinosyl nucleotide triphosphates inhibited incorporation. The rate of *in vitro* synthesis increased with temperature of incubation. Lysates from virus-infected and serum-stimulated cells showed incorporation into cellular DNA for up to 2 hr. Resting cells did not. Therefore, synthesis appeared to reflect the physiological state of the cells before lysate preparation. Incorporation into viral DNA stopped far sooner than that into cellular DNA. During the initial phase of the *in vitro* incubation, incorporation occurred into viral replicative intermediates (RI). A substantial number of these RIs matured to form I DNA at later times in the incubation. Practically all of the RIs preexisting in the infected cell took part in the *in vitro* reaction. DNA synthesis occurred on RIs at all stages of replication and the progeny strands were elongated by up to 80% of unit viral DNA length. Preexisting RIs, pulse labeled *in vivo*, showed evidence of a pool at a late stage of replication which required elongation of their progeny strands by about 25% during conversion to form I molecules. It was also shown that viral DNA synthesis *in vitro* was semiconservative. The main reason for cessation of viral DNA synthesis *in vitro* was the very limited ability of the lysate to initiate new rounds of viral DNA synthesis.

3850 REVERSION AND INDUCTION OF ROUS SARCOMA VIRUS EXPRESSION IN VIRUS-TRANSFORMED BABY HAMSTER KIDNEY CELLS.

(E.) Boettiger, D. (Imp. Cancer Res. Fund Lab., London, England). *Virology* 62(2):522-529, 1974.

Revertants from a clone of baby hamster kidney cells transformed by Schmidt-Ruppin virus were isolated by morphological criteria. In contrast to revertants isolated from other virus-transformed mammalian cells, revertant subclones occurred at high frequency, and the degree of reversion varied from subclone to subclone. A range of phenotypes from transformed to normal was observed. All revertant subclones retained the viral genome. Virus could be rescued by Sendai virus-mediated cell fusion with susceptible chicken cells; however, the frequency of virus rescue from the revertant subclones was much lower than the frequency of virus rescue from transformed subclones. Treatment of revertant subclones with 5-bromodeoxyuridine (< 100 μg/ml) before cell fusion led to a 10-fold increase in virus rescue frequency. It is concluded that reversion is caused by modification in the expression of viral or cellular genes required to maintain the transformed phenotype.

3851 TEMPERATURE-SENSITIVE DNA POLYMERASE FROM ROUS SARCOMA VIRUS MUTANTS.

(E.) Baltimore, D. (Dept. Biol., Massachusetts Inst. Technol., Cambridge), I. M. Verma, S. Drost and W. S. Mason. *Cancer* 34(4):1395-1397, 1974.

DNA polymerase (reverse transcriptase) was isolated from virions of two temperature-sensitive Rous sarcoma virus mutants (ts335 and ts337). These mutants are defective at an early stage of both growth and transformation. The purified polymerase is 3 times more rapidly inactivated by heat than is wild type polymerase. The ribonuclease H activity of the mutant enzyme also shows an increased heat-lability when compared to the wild type activity. Studies on recombinants of the mutants with an avian leukosis virus indicate that the defects in growth and transformation are caused by the heat-lability of the DNA polymerase. These studies strongly support the idea that the virion DNA polymerase of RNA tumor virus is needed to synthesize a DNA copy of the viral genome soon after the infection of a cell by an RNA tumor virus.

3852 IMMUNOFLUORESCENT AND ELECTRON MICROSCOPIC STUDIES OF CULTURED HUMAN CELLS SUCCESSIVELY TRANSFORMED BY ROUS SARCOMA VIRUS AND SIMIAN VIRUS 40. *(E.)* Egusa, K. (Okayama U. Med. Sch., Japan), T. Kuwata and T. Oda. *Acta Med Okayama* 27(5/6):165-175, 1973.

Immunological and electron microscopic techniques were used to study two human embryonic cell strains successively transformed by Rous sarcoma virus (RSV) and simian virus 40 (SV40). One of these strains, which was infected first with RSV and then with SV40, produced SV40 particles, while the other, which was treated in the reverse order, did not. In the first case, the production of SV40 particles declined gradually and the particles disappeared prior to the loss of the virus coat protein as in single-transformed cells. The SV40-producing strain and the nonproducing substrain derived from the SV40-producing strain were reinfected with RSV. The production of virus was not affected by the reinfection. The data suggest that, in these double-transformed human embryonic cells, SV40 production is not due to virus-to-virus interaction, but to virus-to-cell interactions.

3853 PROPERTIES AND LOCATION OF POLY(A) IN ROUS SARCOMA VIRUS RNA. *(E.)* Wang, L. H. (Dept. Mol. Biol., U. California, Berkeley) and P. Duesberg. *J Virol* 14(6):1515-1529, 1974.

The poly(A) sequence of 30-40S Rous sarcoma virus RNA, prepared by digestion of the RNA with RNase T_1, showed a rather homogenous electrophoretic distribution in formamide-polyacrylamide gels. Its size was estimated at about 200 AMP residues. The poly(A) appears to be located at or near the 3' end of the 30-40S RNA because it contains one adenosine/180 AMP residues, and because incubation of 30-40S RNA with bacterial RNase H in the presence of poly(dT) removed its poly(A) without significantly affecting its hydrodynamic or electrophoretic properties in denaturing solvents. The viral 60-70S RNA complex was found to consist of 30-40S subunits both with (65%) and without (approximately 30%) poly(A). The heteropolymeric sequences of these two species of 30-40S subunits have the same RNase T_1-resistant oligonucleotide composition. Some, perhaps all, RNase T_1-resistant oligonucleotides of 30-40S Rous sarcoma virus RNA appear to have a unique location relative to the poly(A) sequence since the complexity of poly(A)-tagged fragments of 30-40S RNA decreased with decreasing size of the fragment. Two RNase T_1-resistant oligonucleotides which distinguish sarcoma virus Prague B RNA from that of a transformation-defective deletion mutant of the same virus appear to be associated with an 11S poly(A)-tagged fragment of Prague B RNA. Thus, RNA sequences concerned with cell transformation seem to be located within 5-10% of the 3' terminus of Prague B RNA.

3854 REGRESSION INCIDENCE OF ROUS SARCOMA VIRUS-INDUCED WING-WEB TUMORS IN INBRED AND OUTBRED CHICKENS AND THEIR CROSSES. *(E.)* Collins, W. M. (Dept. Animal Sci., U. New Hampshire, Durham), A. C. Corbett and W. R. Dunlop. *Poultry Sci* 53(5):1911-1912, 1974.

Six-wk-old White Leghorn (lines 6 and 7) and New Hampshire chickens and crosses between the strains were injected s.c. into the left wing-web with Rous sarcoma virus (0.1 ml of a 10^{-3} dilution). The tumor regression incidence in the line 6 Leghorns was 60%. Reciprocal crosses of lines 6 X 7 showed a 65% incidence of regression. Backcrosses of 6 X 7 regressors to line 6, 6 X 7 regressors to line 7, and F_2 generation progeny showed regression incidences of approximately 80, 25, and 40%, resp. The frequency of regression in line 6 regressors X regressors, New Hampshires, and line 6 regressors X New Hampshires was approximately 68, 7, and 50%, resp. The results suggest that a major gene has a role in tumor regression, and that other genes are probably also involved.

3855 RESISTANCE OF WHITE LEGHORN CHICKENS TO ROUS SARCOMA VIRUS. *(Rus.)* Adzhigitov, F. I. (Inst. Exp. Pathol. Ther., Moscow, USSR), M. T. Ivanov, D. A. Gubeladze and O. Ia. Krivolapchuk. *Veterinariia* (4):56-57, 1974.

One-day-old White Leghorn chicks received intradermal inoculations of a threshold dose (1 chick tumor dose [CTD_{50}]) of Rous sarcoma virus (Carr-Silber strain) which had been passaged in Russian White chicks. In different series of experiments, 0-100% of the chicks developed tumors at the site of injection, confirming that this population is heterogeneous in its resistance to this strain of the virus. There was no significant difference in the frequency with which tumors developed in immunologically immature (1-day-old) and mature (8- to 9-day-old) chicks. When each 1-day-old chick was successively inoculated intradermally with 1, 10 and 100 CTD_{50} of the virus, some chicks did develop tumors while others were resistant even after administration of very large doses (10^8 CTD_{50}). As a rule, tumors grew progressively and killed chicks developing tumors after inoculation of the threshold dose, while tumors which developed in chicks resistant to this threshold dose often regressed when larger doses of virus were administered. Electron microscope examination of tumor sections from chicks sensitive to the threshold dose of virus revealed large numbers of virions with morphological features characteristic of Rous sarcoma virus. Transplantation of these tumors into 3-month-old roosters gave tumors in which the replicating virion, and not the budding, form of virus predominated. Chicks sensitive to the threshold tumor dose showed no evidence of serum antiviral antibodies, although homogenates of their tumors had high titers of active virus in the neutralization and complement-fixation tests and were very tumorigenic when injected into adult Syrian hamsters and monkeys. High antiviral antibody titers were present in sera from resistant chicks, and when they received tumor transplants, regression occurred in 100% of the chicks. Viral titers in tumors from resistant chicks were low, and viral particles were difficult to detect with the electron microscope. Inoculation of these tumors into hamsters and monkeys rarely induced tumors; and if tumors did develop, it was only after a long latent period. Tumorigenicity decreased when virus obtained from sensitive chicks was inoculated into resistant adults, but tumorigenicity increased again when the virus was passaged in sensitive animals. These findings suggest that the properties of Rous sarcoma virus could be changed by inoculating the virus into sensitive and resistant chicks. This is apparently due to changes in the properties of the viral membrane during replication in the cells, depending upon the antigenic status of the host.

3856 ULTRASTRUCTURE OF THE EXTENDED RIBONUCLEIC ACID MOLECULES FROM PURIFIED RIBOSOMES OF ROUS SARCOMA VIRUS-INDUCED MOUSE ASCITES SARCOMA CELLS. *(E.)* Yamamoto, G. (Okayama Univ. Med. Sch., Japan) and T. Oda. *Acta Med Okayama* 28(2):89-98, 1974.

To clarify the ultrastructure of extended ribosomal RNA molecules, electron microscopic observations were carried out on the RNA molecules extracted from purified ribosomes of mouse ascites sarcoma cells. By treatment with ethylenediamine-tetraacetate, agglomerated rRNA molecules were elongated to thread-like structure by partial unfolding. The length of the thread-like molecules was less than 1μ, suggesting that they still contained some coiled RNA. A single strand of RNA stained with uranyl acetate was approximately 15Å in width. This coincided with the width of the strand observable on the original ribosomal surface stained positively with uranyl acetate.

3857 INTERACTION BETWEEN DIFFERENTIATION AND LEUKAEMOGENESIS IN RAUSCHER MURINE LEUKEMIA. *(E.)* Brommer, E. J. P. (Radiobiol. Inst. TNO, Rijswijk, Netherlands) and P. Bentvelzen. *Bibl Haematol* (39):929-934, 1973.

The role of the hemopoietic stem cell in Rauscher leukemia virus was investigated in BALB/c mice injected i.p. with Rauscher leukemia virus (RLV) at age 4 wk. The presence of hemopoietic stem cells was determined by the spleen colony assay. Colony-forming units (CFU) were increased in leukemic mice, but the distribution of the various histological types of colonies did not differ significantly from normal, indicating that the CFUs of leukemic spleens are also pluripotent hemopoetic stem cells. The leukemic spleen cells were capable of restoring lethally irradiated syngeneic mice. Absorbed rabbit antiserum to the virus was cytotoxic to the stem cells in leukemic spleens, indicating the presence of viral antigens on the surface of these cells. Sensitivity of the leukemic stem cells to normal rabbit serum was markedly decreased. Not only erythropoietic but also antigenic and thrombopoietic stimuli promoted the splenomegaly induced by RLV; the radiosensitivity of the leukemic response resembled that of the pluripotent stem cell. It is postulated that RLV infects the hemopoietic system at the level of the stem cells and that the crucial alteration occurs when the stem cell differentiates into the erythroid direction. A combination of viral gene action and activation of cellular genes by humoral stimuli may be required for transformation.

3858 COMPARISON OF RNA POLYMERASE II FROM UNINFECTED AND SIMIAN VIRUS 40-INFECTED PERMISSIVE CV-1 CELLS. *(E.)* Bagshaw, J. C. (Wayne State U. Sch. Med., Detroit, Mich.) and V. F. Righthand. *Biochem Biophys Res Commun* 61(4):1325-1331, 1974.

The nature of the 2- to 3-fold greater RNA synthetic activity of RNA II polymerase from CV-1 cells productively infected by simian virus 40 (SV40) than from uninfected cells was investigated. Enzymes from uninfected and SV40-infected cells did not differ in their preference for different DNA templates (SV40, CV-1, calf thymus) or in their ability to bind SV40 DNA. Thus, preparations from infected cells did not appear to contain more molecules than preparations from uninfected cells. Since polymerases from both uninfected and infected cells incorporated equal amounts of [γ-^{32}P]guanosine triphosphate into RNA, the increased activity of RNA polymerase II from SV40-infected cells may be due to a more rapid rate of RNA chain elongation.

3859 PRESENCE OF TWO ACTIVE X CHROMOSOMES IN HYBRIDS BETWEEN NORMAL HUMAN AND SV40-TRANSFORMED FIBROBLASTS FROM PATIENTS WITH THE LESCH-NYHAN SYNDROME. *(E.)* Croce, C. M. (Wistar Inst. Anat. Biol., Philadelphia, Pa.) and B. Bakay. *Exp Cell Res* 87(2):422-425, 1974.

Skin fibroblasts (LNSV) derived from a hypoxanthine-guanine phosphoribosyltransferase (HGPRT)-deficient patient with the Lesch-Nyhan syndrome [the patient had a glucose-6-phosphate dehydrogenase (G6PD) type A] were transformed with simian virus 40 and hybridized with W138 human diploid fibroblasts derived from a female embryo (these cells had normal HGPRT and G6PD type B activities). The hybrid clones selected in hypoxanthine, aminopterin, and thymidine (HAT) medium were essentially tetraploid and contained three X and one Y chromosome. The hybrids contained HGPRT, types A and B and the AB heteropolymeric form of G6PD enzymes; thus, the X linked genes of both parental cells were fully active. Hybrids back-selected in medium containing 8-azaguanine (8-AG) contained only two X chromosomes. They had no HGPRT activity and they contained only G6PD type A enzyme. The hybrid cells which grew in the presence of 8-AG retained the X chromosome of the LNSV parental cells and apparently retained the inactive X of the W138 cells.

60 LOCALIZATION OF REPLICATING DNA OF SIMIAN VIRUS 40 IN MONKEY KIDNEY CELLS. *(E.)*

eBlanc, D. J. (Natl. Inst. Arthritis, Metab., Dig.
s., Bethesda, Md.) and M. F. Singer. *Proc Natl
ead Sci USA* 71(6):2236-2240, 1974.

vo lines of the BSC-1 strain of African green mon-
ey kidney cells were infected with the 776 strain of
imian virus 40 (SV40). DNA synthesis was measured
y pulse labeling with ^{3}H-thymidine. Approximately
0-85% of the DNA synthesized by the SV40-infected
ells was associated with host nuclear membrane com-
onents, as defined using the M-band technique. A
ubstantial portion of this membrane-associated DNA
as shown to be viral specific by sedimentation
tudies and DNA·DNA hybridization. Examination of
he DNA associated and unassociated with the nuclear
I-band by neutral sucrose gradient analysis suggested
hat while replicating DNA of SV40 is attached to the
uclear membrane, mature component I DNA of SV40 is
released from the membrane upon the completion of
replication.

3861 VIRAL DNA SYNTHESIS IN CELLS INFECTED BY TEMPERATURE-SENSITIVE MUTANTS OF SIMIAN VIRUS 40. *(E.)*

Chou, J. Y. (Natl. Inst. Arthritis, Metab., Dig. Dis., Bethesda, Md.), J. Avila and R. G. Martin. *J Virol* 14(1):116-124, 1974.

Temperature-sensitive mutants of simian virus 40 (SV 40) were classified into those that are blocked prior to viral DNA synthesis at the restrictive temperature ("early" mutants) and those harboring a defect later in the replication cycle ("late" mutants). Mutants of the *A* and *D* complementation groups are early, while those of the *B*, *C*, and *BC* groups are late. These results confirm earlier reports that *A* mutants are defective in a function required for the initiation of each round of viral DNA synthesis. *D* mutants, on the other hand, continue viral DNA replication at the restrictive temperature after preincubation at the permissive temperature. The length of time required for *D* function to be expressed at the permissive temperature - after which infection proceeds unabated on shifting the cultures to the restrictive temperature - is 10-20 hr. The viral DNA synthesized in *D* mutants under these conditions progresses in normal fashion through replicative intermediate molecules to mature component I and II DNA molecules.

3862 AN SV40-INDUCED INITIATION FACTOR FOR PROTEIN SYNTHESIS CONCERNED WITH THE REGULATION OF PERMISSIVENESS. *(E.)*

Nakajiima, K. (Inst. Med. Sci., Tokyo, Japan), H. Ishitsuka and K. Oda. *Nature* 252(5485):649-653, 1974.

A factor present in the high salt extracts of ribosomes from simian virus 40 (SV40)-transformed African green monkey kidney cells catalyzed the binding of late human adenovirus mRNA to ribosomes to form the 80S initiation complex for protein synthesis. The factor was specific for late adenovirus type 2, and formation of the 80S complex protected mRNA from degradation. The factor may be the result of either modification of a preexisting M3 factor or induction of a new M3 factor by the SV40 gene function. The efficiency of the SV40 helper function in supporting synthesis of adenovirus 2 virion antigen in SV40-infected simian cells depends on the multiplicity of SV40 infection and correlates with the efficiency of induction of cellular mRNA synthesis. The alteration of ribosomes in SV40-infected simian cells which is necessary for the response to late adenovirus 2 and protein synthesis is also multiplicity dependent. These results support the assumption that the derepression of the cellular function is involved in the helper function.

3863 ALTERED PROTEIN METABOLISM IN INFECTION BY THE LATE tsB11 MUTANT OF SIMIAN VIRUS 40. *(E.)*

Tegtmeyer, P. (Dep. Pharm., Case West. Reserve Univ., Cleveland, Ohio), J. A. Robb, C. Widmer and H. L. Ozer. *J Virol* 14(4):997-1007, 1974.

Gel electrophoresis studies showed that the temperature-sensitive mutant tsB11 of simian virus 40 is replicated at the same rate as the DNA of wild-type virus in infection at the restrictive temperature. The progeny mutant DNA cannot be distinguished from wild-type DNA by gel electrophoresis and is assembled into a nucleoprotein complex with the same velocity sedimentation characteristics as the wild-type complex. Analysis of *in vivo* protein synthesis by sodium dodecyl sulfate polyacrylamide gel electrophoresis and immunoprecipitation techniques demonstrated that the capsid components VP1, VP2, and VP3 of the mutant and wild-type virus are synthesized at a similar rate, but VP1 does not accumulate within cells infected by tsB11. Furthermore, VP1 is located predominantly in the cytoplasmic rather than in the nuclear fraction of extracts from mutant-infected cells. Immunofluorescent studies localized virion antigen within the nucleolus as well as the cytoplasm. The altered intracellular distribution and stability of VP1 suggest that it may be the mutant protein of tsB11. The synthesis of a 72,000 dalton protein is consistently induced in significant quantity in cells infected by tsB11 at the restrictive temperature. A protein of the same apparent molecular wt is present in smaller quantities in uninfected cells and is only slightly increased in quantity in cells infected by wild-type virus.

3864 ATTEMPTS TO RECOGNIZE AN ONCOGENIC VIRUS IN ^{224}Ra-INDUCED MURINE OSTEOSARCOMA. *(E.)*

Erfle, V. F. (X-Ray Environ. Res. Soc., Neuherberg, Germany), A. Luz, I. D. Adler and K. H. Marquart. *Radiat Res* 59(1):90, 1974.

3865 VIRUS PARTICLES IN ^{224}Ra-INDUCED MURINE OSTEOSARCOMA. *(E.)*

Marquart, K. H. (X-Ray Environ. Res. Soc., Munich, Germany), A. Luz, W. Gossner and V. Erfle. *Radiat Res* 59(1): 90, 1974.

3866 COMPARISON OF RNA POLYMERASES FROM UNINFECTED AND SIMIAN VIRUS 40-INFECTED CELL CULTURES. *(E.)* Bagshaw, J. C. (Wayne State U. Sch. Med., Detroit, Mich.) and V. F. Righthand. *Fed Proc* [*II*] 33(5):1544, 1974.

3867 SYNTHESIS OF A DNA BINDING PROTEIN (P8) IN NORMAL AND TRANSFORMED CELLS. *(E.)* Rubio, V. (Flow Lab., Inc., Rockville, Md.) and C. Long. *Fed Proc* [*II*] 33(5):1544, 1974.

3868 PARTICLES WITH CHARACTERISTICS OF LEUKOVIRUSES IN CULTURES OF MARROW CELLS FROM LEUKEMIC PATIENTS IN REMISSION AND RELAPSE. *(E.)* Mak, T. W. (Dept. Med., U. Toronto, Canada), J. Manaster, A. F. Howatson, E. A. McCulloch and J. E. Till. *Proc Natl Acad Sci USA* 71(11):4336-4340, 1974.

3869 THE CHARACTERIZATION OF POLYOMA VIRION PROTEINS. *(E.)* Schaffhausen, B. S. (Brandeis U., Waltham, Mass.). *Diss Abst Int B* 35(6):2628-B-2629-B, 1974.

3870 RNA VIRUS PARTICLES IN VARIETY OF TUMORS IN LOW-LEUKEMIA STRAIN OF MICE. *(E.)* Ohmori, M. (Okayama U. Med. Sch., Japan). *J Electron Microsc (Tokyo)* 23(3):220, 1974.

3871 DEMONSTRATION AND CHARACTERIZATION OF A VIRUS INHIBITORY FACTOR IN ADENOVIRUS-INDUCED HAMSTER TUMOR CELLS. *(E.)* Champe, P. C. (Rutgers U., New Brunswick, N.J.). *Diss Abst Int B* 35(6):2903-B, 1974.

3872 TYPE 2 HERPES VIRUS MAY OPERATE IN TWO WAYS. *(E.)* Roizman, B. (Dept. Microbiol. Biophys., U. Chicago, Ill.). *Cancer Cytol* 13(2):6, 1973.

3873 LINK BETWEEN GENITAL HERPES, CERVICAL CANCER REPORTED. *(E.)* Skinner, G. R. B. (No affiliation). *Cancer Cytol* 13(2):6, 1973.

3874 COMMON TUMOR-SPECIFIC ANTIGEN FOUND IN 10 VARIETIES OF TUMOR. *(E.)* Carvajal, G. (Natl. Polytech Inst., Mexico City, Mexico). *Cancer Cytol* 13(2):6-7, 1973.

3875 INDUCED INTERFERON MAY DESTROY CERVICAL CANCER CELLS. *(E.)* Ayre, J. E. (Natl. Cancer Cytol. Ctr., Melville, N.Y.) and R. Narvaez. *Cancer Cytol* 13(2):7, 1973.

3876 BACTERIA TRANSFORMATION LINKED TO CERVICAL CANCER GENESIS. *(E.)* Leppaluoto, P. (Lab. Cancer Soc., Tampere, Finland). *Cancer Cytol* 13(2):7, 1973.

3877 XC-CELL FUSION INDUCED BY MURINE PLASMOCYTOMA CELLS. I. ALTERNATE "SWITCHING OFF" AND "SWITCHING ON" BY *IN VIVO - IN VITRO* TRANSFERS. *(E.)* Lefebvre, J. C. (INSERM, Lille, France) and P. Lemay. *Biomedicine* 21(9):378-381, 1974.

3878 HERPES VIRUS INFECTION, IMMUNITY AND CANCER. *(E.)* Anonymous. *Clin Bull* 4(2):76-77, 1974.

3879 TRANSPLANTATION OF A MAREK'S DISEASE LYMPHOMA IN SYNGENEIC CHICKENS. *(E.)* Theis, G. A. (New York Med. Coll., Valhalla), L. W. Schierman and R. A. McBride. *J Immunol* 113(6):1710-1715, 1974.

3880 SPECIFICITY DIFFERENTIATION OF HERPES SIMPLEX VIRUS TYPES 1 AND 2 BY INDIRECT IMMUNOFLUORESCENCE. *(E.)* Fraser, C. E. O. (Harvard Med. Sch., Boston, Mass.), L. V. Melendez and T. Simeone. *J Infect Dis* 130(1):63-66, 1974.

3881 TWO CELL LINES FROM LYMPHOMAS OF MAREK'S DISEASE. *(E.)* Akiyama, Y. (Res. Inst. Microbial Dis., Osaka U., Japan) and S. Kato. *Biken J* 17(13):105-116, 1974.

3882 STRUCTURAL PROTEINS OF INTRACISTERNAL A-PARTICLES: POSSIBLE REPETITIVE SEQUENCES. *(E.)* Marciani, D. J. (Natl. Cancer Inst., Bethesda-Md.) and E. L. Kuff. *J Virol* 14(6):1597-1599, 1974.

3883 AN ULTRASTRUCTURAL STUDY OF C-TYPE VIRION ASSEMBLY IN MOUSE CELLS. *(E.)* Luftig, R. B. (Worcester Found. Exp. Biol., Shrewsbury, Mass.), P. N. McMillan and D. P. Bolognesi. *Cancer Res* 34 (12):3303-3310, 1974.

3884 ANTIGENIC STUDIES ON GIBBON TYPE-C VIRUSES. *(E.)* Kawakami, T. G. (Comp. Oncol. Lab., Univ. California, Davis) and P. M. Buckley. *Transplant Proc* 6(2):193-196, 1974.

3885 NUCLEIC ACID HOMOLOGY OF MURINE TYPE-C VIRAL GENES. *(E.)* Callahan, R. (Natl. Cancer Inst., Bethesda, Md.), R. E. Benveniste, M. M. Lieber and G. J. Todaro. *J Virol* 14(6):1394-1403, 1974.

3886 RECOVERY OF MURINE XENOTROPIC TYPE-C VIRUS FROM C57L MICE. *(E.)* Arnstein, P. (Natl. Cancer Inst., Bethesda, Md.), J. A. Levy, L. S. Oshiro, P. J. Price, W. Suk, and E. H. Lennette. *J Natl Cancer Inst* 52/53(1/6):1787-1792, 1974.

387 TYPE-C VIRUS PARTICLES IN A FELINE ANGIOMA: A CASE REPORT. *(E.)* Feldman, D. G. Veterans Adm. Hosp., Bronx, N.Y.), T. Ehrenreich and . Gross. *J Natl Cancer Inst* 52/53(1/6):1843-1846, 974.

388 ATYPICAL C PARTICLES IN ADENOCARCINOMAS INDUCED BY IMPLANTATION OF FUKU CELLS. *(E.)* agi, M. J. (Dep. Bacteriol. Immunol., Univ. Calif., erkeley), S. T. Hamamoto, J. G. Duafala and D. R. itelka. *J Natl Cancer Inst* 52/53(1/6):1835-1837, 974.

889 LEVELS OF RAT CELLULAR RNA HOMOLOGOUS TO EITHER KIRSTEN SARCOMA VIRUS OR RAT TYPE-C IRUS IN CELL LINES DERIVED FROM OSBORNE-MENDEL RATS. *E.)* Scolnick, E. M. (Natl. Cancer Inst., Bethesda, d.), J. M. Maryak and W. P. Parks. *J Virol* 14(6): 435-1444, 1974.

3890 ROLE OF C-TYPE VIRUS IN BOVINE LYMPHOSARCOMA. *(E.)* Olson, C. (Dep. Vet. Sci., Univ. Wisconsin, Madison), L. D. Miller and J. M. Miller. *Bibl Haematol* (39):198-205, 1973.

3891 PLAQUE FORMATION WITH SIMIAN VIRUS 40: ENHANCEMENT BY DIMETHYL SULFOXIDE. *(E.)* Cleaver, J. E. (Lab. Radiobiol., Univ. California, San Francisco). *J Virol* 14(6):1607-1610, 1974.

3892 BIOLOGICAL STUDIES IN FOUR SPECIES OF NONHUMAN PRIMATES WITH SIMIAN SARCOMA VIRUS *(LAGOTHRIX)*. *(E.)* Theilen, G. H. (Sch. Vet. Med., Univ. Calif., Davis), L. G. Wolfe, H. Rabin, F. Deinhardt, D. L. Dungworth, M. E. Fowler, D. Gould and R. Cooper. *Bibl Haematol* (39):251-257, 1973.

3893 A COMPARITIVE STUDY *IN VITRO* OF A SIMIAN VIRUS ISOLATED FROM SPONTANEOUS WOOLLY MONKEY FIBROSARCOMA AND OF A KNOWN FELINE FIBROSARCOMA VIRUS. *(E.)* Kawakami, T. G. (Sch. Vet. Med., Univ. Calif., Davis), P. Buckley, S. Huff, D. McKain and H. Fielding. *Bibl Haematol* (39):236-243, 1973.

3894 VIRIONS RELEASED FROM THE SURFACE OF LEUKOVIRUS-PRODUCING CELLS. *(E.)* Vyazov, S. O. (USSR Acad. Med. Sci., Moscow), A. D. Altstein and V. M. Zhdanov. *Arch Gesamte Virusforsch* 46(3/4): 198-204, 1974.

3895 MODES OF CELL DEATH IN RAUSCHER LEUKAEMIA VIRUS INFECTION. *(E.)* Donald, K. J. (Med. Fac., Erasmus Univ., Rotterdam, Netherlands), L. J. L. D. van Griensen and E. van't Hull. *Pathology* 6(4):315-322, 1974.

3896 THE HAEMATOPOIETIC STEM CELL IN RAUSCHER VIRUS-INDUCED ERYTHEROBLASTOSIS OF BALB/C MICE. *(E.)* Brommer, E. J. P. (Radiobiol. Inst., Rijswijk, Netherlands) and P. Bentvelzen. *Eur J Cancer* 10(12):827-833, 1974.

3897 ANTISERUM INACTIVATION OF HEMATOPOIETIC COLONY FORMING STEM CELLS FROM MICE WITH RAUSCHER LEUKEMIA. *(E.)* OKunewick, J. P. (Allegheny Gen. Hosp., Pittsburgh, Pa.), E. L. Phillips and B. J. Brozovich. *Experientia* 30(12):1470-1471, 1974.

3898 INHERITANCE OF SUSCEPTIBILITY TO FRIEND MOUSE LEUKEMIA VIRUS. XII. EFFECTS OF THE *Fv-1* LOCUS. *(E.)* Odaka, T. (Inst. Med. Sci. Tokyo, Japan). *Int J Cancer* 14(2):252-258, 1974.

3899 DETECTION OF THE FELINE LEUKEMIA VIRUS AND OTHER MAMMALIAN ONCORNAVIRUSES BY IMMUNOFLUORESCENCE. *(E.)* Hardy, W. D., Jr. (Sloan-Kettering Inst. Cancer Res., New York, N.Y.), Y. Hirshaut and P. Hess. *Bibl Haematol* (39):778-799, 1973.

3900 PROPERTIES OF FELINE LEUKEMIA VIRUS. II. *IN VITRO* LABELING OF THE POLYPEPTIDES. *(E.)* Velicer, L. F. (Dep. Microbiol. Public Health, Michigan State Univ., East Lansing) and D. C. Graves. *J Virol* 14(3):700-703, 1974.

3901 MOLECULAR WEIGHT OF TWO ONCORNAVIRUS GENOMES: DERIVATION FROM PARTICLE MOLECULAR WEIGHTS AND RNA CONTENT. *(E.)* Bellamy, A. R. (Dep. Cell Biol. Phys., Univ. Auckland, New Zealand), S. C. Gillies and J. D. Harvey. *J Virol* 14(6):1388-1393, 1974.

3902 INTERSPECIES INFECTION BY FELINE LEUKEMIA VIRUS: SERIAL CELL-FREE TRANSMISSION IN DOGS OF MALIGNANT LYMPHOMAS INDUCED BY FELING LEUKEMIA VIRUS. *(E.)* Rickard, C. G. (New York State Vet. Coll., Ithaca), J. E. Post, F. Noronha and L. M. Barr. *Bibl Haematol* (39):102-112, 1973.

3903 INFLUENCE OF INTERFERON ON VIRUS-PARTICLE SYNTHESIS IN ONCORNAVIRUS-CARRIER LINES. II. EVIDENCE FOR A DIRECT EFFECT ON PARTICLE RELEASE. *(E.)* Billiau, A. (Dep. Microbiol., Rega Inst., Univ. Leuven, Belgium), V. G. Edy, H. Sobis and P. de Somer. *Int J Cancer* 14(3):335-340, 1974.

3904 STUDIES ON THE COMBINED EFFECTS OF ONCORNA VIRUSES AND CHEMICAL CARCINOGENS IN MICE. *(E.)* McCarter, J. A. (Cancer Res. Lab., Univ. Western Ontario, London, Canada) and J. K. Ball. *Biochem Dis* 4(Part B): 361-368, 1974.

3905 ANTIGENIC DIFFERENCES BETWEEN ISOLATES OF HERPESVIRUS TYPE 2. *(E.)* Seth, P. (Dep. Pathol., McMaster Univ., Hamilton, Canada), W. E. Rawls, R. Duff, F. Rapp, E. Adam and J. L. Melnick. *Intervirology* 3(1/2):1-14, 1974.

3906 VIRUS-HOST-CELL RELATIONSHIP OF *HERPESVIRUS SYLVILAGUS* WITH COTTONTAIL RABBIT LEUKOCYTES. *(E.)* Wegner, D. L. (Univ. Wisconsin Med. Sch., Madison) and H. C. Hinze. *Int J Cancer* 14(5):567-575, 1974.

3907 TEMPERATURE-SENSITIVE MUTANTS OF ADENOVIRUS TYPE 12 DEFECTIVE IN VIRAL DNA SYNTHESIS. *(E.)* Ledinko, N. (Dep. Biol., Univ. Akron, Ohio). *J Virol* 14(3):457-468, 1974.

3908 INFECTIOUS DNA-PROTEIN COMPLEX FROM CELLS PRODUCTIVELY INFECTED WITH SIMIAN ADENOVIRUS SA7. *(E.)* Tálas, M. (Baylor Coll. Med., Houston, Tex.) and J. S. Butel. *Intervirology* 3(1/2):54-62, 1974.

3909 CYTOGENETIC STUDIES IN PERMISSIVE AND ABORTIVE INFECTIONS BY ADENOVIRUS TYPE 12. *(E.)* McDougall, J. K. (Dep. Cancer Stud., Birmingham, England), K. E. Vause, P. H. Gallimore and A. R. Dunn. *Int J Cancer* 14(2):236-243, 1974.

3910 CELLULAR MONSTROSITY IN EMBRYONIC NEURONAL NEOPLASM PRODUCED BY HUMAN ADENOVIRUS IN RATS. *(E.)* Mukai, N. (Retina Found., Boston, Mass.), S. Kobayashi and T. Murao. *Acta Neuropathol (Berl)* 30(4):315-328, 1974.

3911 NASOPHARYNGEAL CARCINOMA AND EPSTEIN-BARR VIRUS. I. FACTORS RELATED TO THE ANTI-VCA ANTIBODY. *(E.)* Lynn, T. C. (Natl. Cancer Cent. Res. Inst., Tokyo, Japan), S. M. Tu, T. Hirayama and A. Kawamura, Jr. *Asian Med J* 17(4):21-36, 1974.

3912 NASOPHARYNGEAL CARCINOMA AND EPSTEIN-BARR VIRUS. II. CLINICAL COURSE AND THE ANTI-VCA ANTIBODY. *(E.)* Lynn, T. (Natl. Cancer Cent. Res. Inst., Tokyo, Japan), S. M. Tu, T. Hirayama and A. Kawamura, Jr. *Asian Med J* 17(4):37-48, 1974.

3913 *PAPOVAVIRIDAE.* *(E.)* Melnick, J. L. (Baylor Coll. Med., Houston, Tex.), A. C. Allison, J. S. Butel, W. Eckhart, B. E. Eddy, S. Kit, A. J. Levine, J. A. R. Miles, J. S. Pagano, L. Sachs and V. Vonka. *Intervirology* 3(1/2):106-120, 1974.

3914 INDUCTION OF POLYOMA TUMORS IN ATHYMIC NUDE MICE. *(E.)* Vandeputte, M. (Rega Inst., Univ. Leuven, Belgium), H. Eyssen, H. Sobis and P. De Somer. *Int J Cancer* 14(4):445-450, 1974.

3915 *IN VITRO* RADIOISOTOPIC LABELING OF PROTEINS ASSOCIATED WITH PURIFIED POLYOMA VIRIONS. *(E.)* McMillen, J. (Div. Biol., Kansas State Univ., Manhattan) and R. A. Consigli. *J Virol* 14(6):1627-1629, 1974.

3916 CHARACERIZATION OF POLYOMA DNA-PROTEIN COMPLEXES I. ELECTROPHORETIC IDENTIFICATION OF THE PROTEINS IN A NUCLEOPROTEIN COMPLEX ISOLATED FROM POLYOMA-INFECTED CELLS. *(E.)* McMillen, J. (Div. Biol., Kansas State Univ., Manhattan) and R. A. Consigli. *J Virol* 14(6):1326-1336, 1974.

3917 GENETICS OF AVIAN RNA TUMOR VIRUSES: A REVIEW OF RECENT DEVELOPMENTS. *(E.)* Vogt, P. K. (Univ. Southern California Sch. Med., Los Angeles), M. Linial, W. S. Mason, R. A. Weiss, J. A. Wyke and R. R. Friis. *Biochem Dis* 4(Part B): 619-630, 1974.

3918 EXTENT OF BOUBLE STRANDEDNESS IN AVIAN MYELOBLASTOSIS VIRUS RNA. *(E.)* Cavalieri, L. F. (Sloan-Kettering Inst. Cancer Res., Rye, N.Y.) *J Virol* 14(6):1458-1462, 1974.

3919 MECHANISTIC INDEPENDENCE OF AVIAN MYELOBLASTOSIS VIRUS DNA POLYMERASE AND RIBONUCLEASE H. *(E.)* Brewer, L. C. (Coll. Agric. Life Sci., Univ. Wisconsin, Madison) and R. D. Wells. *J Virol* 14(6):1494-1502, 1974.

3920 POLYPEPTIDES ASSOCIATED WITH THE 250 S MENGOVIRUS-INDUCED RNA POLYMERASE STRUCTURE. *(E.)* Loesch, W. T., Jr. (M. D. Anderson Hosp. Tumor Inst., Houston, Tex.) and R. B. Arlinghaus. *Arch Gesamte Virusforsch* 46(3/4):253-268, 1974.

3921 ULTRASTRUCTURAL STUDY OF CYTOPLASMIC INCLUSIONS IN CASES OF VIRAL HEPATITIS AND HEPATOMAS. *(E.)* Scotto, J. (INSERM,Hosp. St. Antoine, Paris, France), J. C. Homberg, H. Stralin and J. Caroli. *Pathol Eur* 9(3):211-216, 1974.

See also:

* (Rev): 3606, 3607, 3608, 3609, 3610, 3611, 3612, 3625, 3630, 3636, 3637, 3638, 3639, 3644
* (Chem): 3655, 3669, 3734, 3777
* (Immun): 3923, 3926, 3929, 3940, 3942, 3954, 3956, 3957, 3959, 3975, 3976, 3997, 3998, 4003, 4010, 4021, 4037
* (Epid-Biom): 4082, 4085

3922 CLINICAL SIGNIFICANCE OF T-CELLS IN CHRONIC LYMPHOCYTIC LEUKAEMIA. *(E.)* Catovsky, D. (R. Postgrad Med. Sch., London, England), E. Miliani, A. Okos and D. A. G. Galton. *Lancet* (7883):751-752, 1974.

T-cell and B-cell markers were studied in 30 patients (aged 30-80 yr) with chronic lymphocytic leukemia (CLL). The patients were divided into two main groups: untreated (18) with clinically stable disease, and treated (12) with evidence of active disease. The majority of circulating lymphocytes in both groups had B-cell characteristics as demonstrated by positive immunofluorescence with the techniques for surface-bound immunoglobulins and/or aggregated γ-globulin. However, the absolute number of circulating T-lymphocytes, calculated on the basis of total and differential WBC count, was significantly higher (mean 3590/µl) in the untreated group than in the treated group (mean 1050/µl). Two-thirds of the untreated patients had values above the normal range while 1/2 of the treated patients had values below the normal range. The increase in T-lymphocytes may indicate a normal immunologic reaction to the disease process, although other explanations are possible. Low serum-immunoglobulin values and splenomegaly were frequent in the treated group.

3923 HUMORAL IMMUNITY IN MURINE VIRAL RETICULOSARCOMATOSIS. *(Rus.)* Bergolts, V. M. (P. A. Gertsen Sci. Res. Inst. Oncol., Moscow, USSR), O. Ia. Moskovkina, P. P. Sokolov, G. M. Sukhin and I. A. Kondratieva. *Vopr Onkol* 20(11):35-39, 1974.

Studies were carried out on inbred CC57BR/MV and C57Bl/6 mice of viral reticulosarcomatosis (RS) including the rate of leukemic development, cytotoxic humoral antibodies in murine sera, the number of spleen cells with Ig on their surface and the number of antibody producing cells in the spleen. Virus was isolated from heparinized plasma of infected CC57BR/MV mice. The plasma was centrifuged twice at 2,500 rev/min for 20 min and diluted 1:1,000 in medium No. 199 for CC57BR/MV mice, and 1:5 for C57Bl/6 mice. The animals were injected i.v. with 0.2 ml of the solution. Complete Freund's adjuvant (CFA) was injected i.p. (0.1 ml) simultaneously with the tumor cells. Cytological investigation of RS development in CC57BR/MV mice showed that the injection of RS virus in combination with CFA resulted in a more vigorous leukemic process than did RS virus alone. In C57Bl/6 mice, injection of RS virus and CFA resulted in leukemia. No cytotoxic humoral antibodies were found in the mice of either line. All the experiments showed a temporary increase in the number of spleen cells with Ig. Immune reations of the animals differed substantially, depending on the form and the stage of the disease, virus dosage and, particularly, the genetic reactivity of the tumor-bearing animal.

3924 EFFECT OF EARLY THYMECTOMY AND ADMINISTRATION OF HETEROLOGOUS RNA ON THE DEVELOPMENT OF SPONTANEOUS MAMMARY TUMORS IN MICE. *(Rus.)* Beliaev, D. K. (Inst. Cytol. Genet., Novosibirsk, USSR), I. Iu. Videlets, N. A. Matienko and E. V. Grutenko. *Vopr Onkol* 20(7):63-66, 1974.

The effect of heterologous RNA administration on the development of spontaneous tumors in early thymectomized mice was studied in two series of experiments. In the first series, in which 17 mature female C3H/He mice were injected i.p. with 10 mg bovine liver RNA preparation (RNA, 60-70%; protein, 2-4%, polysaccharides, 30-35%; water, 5-10%), 14 animals (82%) developed tumors between 8 and 15 months. All 20 of the untreated controls developed tumors between 7 and 14 months. The latent period in the RNA-injected mice was 43 ± 19 days longer than in the control mice. In the second series, of 23 females thymectomized on the 6th day, 19 (83%) developed tumors; of 12 thymectomized animals receiving RNA injections, 9 (75%) developed tumors; all 15 controls of the second series developed tumors between the 9th and 15th months. The latent period of tumor induction for the thymectomized, non RNA-treated mice was 61±21 days longer than in the control mice; for the thymectomized, RNA-treated mice, 67±29 days longer. The results indicate that the administration of heterologous RNA or early thymectomy inhibited mammary tumor induction. The administration of RNA to thymectomized mice does not significantly inhibit the development of the tumors.

3925 LEUKEMIC SERUM INHIBITION OF PHYTOHEMAGGLUTININ-INDUCED TRANSFORMATION. *(E.)* Humphrey, G. B. (Univ. Oklahoma Health Sci. Cent., Oklahoma City), J. Lankford, S. Oleinick and R. Nitschke. *J Immunol* 113(1):63-69, 1974.

The influence of leukemic serum on phytohemagglutin-P (PHA-P)-induced lymphocytic transformation was studied. Twenty of 22 pretreatment sera collected at diagnosis inhibited the transformation of normal lymphocytes stimulated with PHA-P (1 µl for 72 hr) by more than 50%. Kinetic studies of transformation demonstrated that leukemic serum inhibited rather than delayed transformation. In normal serum the peak transformation of normal lymphocytes occurred on day 3, whereas the transformation in leukemic serum was significantly inhibited throughout the 5-day experiment. The inhibition of transformation by PHA-P was assumed to be due to binding of PHA by components of leukemic serum because the inhibition could be overcome by increasing the PHA-P concentration to 10 µl. Experiments with lysates of lymphocytes preincubated with PHA and leukemic serum further substantiated the PHA-binding mechanism of leukemic serum. Lysates from cells incubated 24 hr in leukemic serum and 1 µg PHA-P produced transformation which was significantly lower than that initiated by lysates prepared after incubation in normal serum. The difference in transformation did not occur at the higher PHA-P concentration. Whether the differences in binding capacity of normal and leukemic serum are qualitative or quantitative remains to be determined.

3926 NEUTRALIZATION OF FRIEND LEUKEMIA VIRUS BY SERA OF UNIMMUNIZED ANIMALS. *(E.)* Bendinelli, M. (Inst. Microbiol., Univ. Pisa, Italy), L. Nardini and M. Campa. *J Gen Virol* 22(2):207-214, 1974.

The splenomegaly induced in BALB/c mice by i.v. injection of Friend leukemia virus (FLV) diluted to 10^{-2} was markedly inhibited when the virus was preincubated at 37 C with sera of domestic and laboratory animals. Of 54 sera from 16 different species, only mouse, rat, and sheep sera were unable to neutralize FLV. The reaction was partially heat labile and was abolished by heating at 56 C for 30 min. Removal of divalent cations (Ca^{2+} and Mg^{2+}) with EDTA also destroyed most of the serum neutralizing activity; however, their removal from previously neutralized FLV did not reverse the reaction. Complement depletion of serum abolished the hemolytic activity and abolished or strongly reduced the FLV neutralizing activity; recombination of complement reagents concomitantly restored the hemolytic and FLV neutralizing activity. It is suggested that the neutralizing activity may be operative *in vivo* and contribute to the narrow range of animal susceptibility to FLV.

3927 CELLULAR IMMUNE REACTIONS DURING THE GROWTH OF MALIGNANT TUMORS. *(Ger.)* Grundmann, E. (Inst. Pathol., Univ. Munster, Germany). *Arch Geschwulstforsch* 43(2):115-123, 1974.

Original experiments and literature data on cellular immune reactions occurring during the growth of malignant tumors are presented. In NMRI mice murine antilymphocyte antiserum prepared in rabbits prevented the rejection of a xenogeneic transplant of Jensen's intramuscular tumor from a female Wistar rat. There were no peritumoral lymphocyte infiltrates. Implantation of methylcholanthrene-induced sarcomas in isogeneic rats failed to cause peritumoral lymphocyte infiltration, while such infiltration occurred following presensitization with the same tumor. The lymphocytes not only destroyed tumor tissue, but also reduced the mitotic tumor proliferation. Treatment with antilymphocyte serum not only prevented the rejection of the exogeneic tumor transplants, but also increased the rate of mitosis. Experimental and clinical observations indicate the great significance of T-lymphocytes and of the thymus in the immunological defense against tumors. According to the hypothesis, tumors occurring rather frequently, especially in elderly subjects, are either destroyed or inhibited in their growth by immunological control factors, especially by T-lymphocytes. The appearance of a manifest malignant tumor is regarded as a consequence of the failure of this immunological control. The occurrence of "immune tumors" suggests that the development of malignant tumors may be due to an immunological unmasking of viral and genetic information.

3928 COMPARATIVE AUTORADIOGRAPHIC STUDY OF THE STROMAL REACTION IN MELANOMA AND BASAL CELL EPITHELIOMA. *(Ger.)* Pullman, H. (Dermatol. Clin., Univ. Cologne, Germany) and G. K. Steigleder. *Arch Derm Forsch* 250(2):173-176, 1974.

The number of proliferating cells (^{3}H-thymidine-labeling index) in infiltrates of human malignant melanoma (primary tumors; four superficial spreading melanomas and seven tumorous forms) was compared with that in basal cell epithelioma (9 solid and 2 scirrhous forms). The mean labeling index of infiltrates of malignant melanoma was 2.16 ± 0.35% compared to 0.46 ± 0.25% in basal cell epithelioma. Phagocytized melanine was present in 1.25% of the lymphocytoid cells in the infiltrate of malignant melanoma, for which no correlate was found in the infiltrate in basal cell epithelioma. The higher labeling index of the infiltrate of malignant melanoma is due to activation of DNA-synthesizing lymphoid cells. The cellular stromal reaction in malignant melanoma is considered to be a manifestation of an immune phenomenon. Because of its higher ^{3}H-thymidine-labeling index, the antigenicity of malignant melanoma is greater than that of basal cell carcinoma. However, it is not clear why malignant melanoma grows and metastasizes despite the apparently stronger immune response which it produces.

3929 STUDY OF THE CELLULAR IMMUNE RESPONSE TO GROSS VIRUS-INDUCED LYMPHOMA BY THE MIXED LYMPHOCYTE-TUMOR INTERACTION. *(E.)* Glaser, M. (Lab. Cell Biol., Natl. Cancer Inst., Bethesda, Md.), R. B. Herberman, H. Kirchner and J. Y. Djeu. *Cancer Res* 34(5):2165-2171, 1974.

A one-way mixed lymphocyte-tumor cell interaction assay was applied to the study of cell-mediated immunity to a syngeneic Gross virus-induced lymphoma, (C58NT)D, in W/Fu rats. Lymphoid cells from the spleens of rats inoculated by the tumor cells were stimulated *in vitro* by incubation with intact, inactivated tumor cells. Optimal conditions for stimulation were incubation of 6 x 10^5 spleen cells and 2 x 10^4 mitomycin C-treated tumor cells for four days. Significant stimulation was first detected at 14 days after tumor cell inoculation, reached a peak at days 20 to 40, and gradually declined to low levels by day 90. (Mitomycin-C treatment was more effective than exposure of the stimulating cells to x-rays.) Immunization with from 1 x 10^5 to 1 x 10^8 tumor cells induced similar reactivity; 1 x 10^9 cells produced progressive tumor growth and no reactivity was seen. Treatment of immune spleen cells with specific anti-rat thymocyte serum abolished their response while removal of complement receptor-bearing lymphocytes from the spleens did not reduce the reactivity. Specificity was shown by inability of three other W/Fu rat tumor cells to stimulate (C58NT)D-immune W/Fu spleen cells and by inability of (C58NT)D cells to stimulate spleen cells obtained either from normal W/Fu rats or from W/Fu rats inoculated with another W/Fu tumor. These results indicate that the one-way mixed lymphocyte tumor cell interaction may measure cellular immunity and not primary recognition of antigens of Gross virus-induced lymphoma, and that thymus-processed lymphoid cells are needed for the reactivity in the one-way mixed lymphocyte-tumor cell interaction.

3930 POSSIBLE IMMUNOLOGICAL SIGNIFICANCE OF HEPATOMEGALY AND SPLENOMEGALY AS RECORDED BY HEPATIC GAMMA SCANNING IN PATIENTS WITH MALIGNANT MELANOMA. *(E.)* Ikonopisov, R. L. (Natl. Cent. Oncol., Med. Acad., Sofia, Bulgaria) and V. I. Oreshikov. *Tumori* 60(2):99-104, 1974.

Liver and spleen gamma scans of 88 patients with malignant melanoma (none with metastatic deposits to the liver and/or spleen) were compared with scans of 100 patients with gastric, mammary, rectal, and pulmonary carcinoma. The melanoma patients included both sexes, all age groups, and various clinical stages of the disease. Hepatomegaly was present in 42% and splenomegaly in 37% of the patients with malignant melanoma, whereas in the patients with other solid tumors the incidence of hepatomegaly was 12% and that of splenomegaly, 7.4%. In another study, the mean frontal surface (MFS) of the liver was calculated (according to McAfee's formula) for another 94 patients with malignant melanoma, 137 with cancer of the colon and rectum, and 64 with breast cancer. The MFS was 183.3 cm^2 for malignant melanoma compared with 137.6 cm^2 for colorectal cancer and 169.6 cm^2 for breast cancer. The approximately 4-fold higher incidence of splenomegaly in patients with malignant melanoma and the marked hepatomegaly in these patients, confirmed by measurement of liver MFS, suggest that these changes may be significant in the immunologic assessment of the host-tumor relationship.

3931 MALIGNANCY IN A SERIES OF 70 PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATOSUS. *(E.)* Canoso, J. J. (Boston U. Sch. Med., Mass.) and A. S. Cohen. *Arthritis Rheum* 17(4):383-390, 1974.

Sixty-three women and seven men with systemic lupus erythematosus (SLE) were followed for a median duration of six yr and eight months and the incidence of malignancies occurring during this period was determined. Eight of these patients developed a variety of tumors which included one reticulum cell sarcoma, one multiple myeloma, one Bowen's carcinoma of the skin, three *in situ* and two invasive carcinomas of the cervix. The median age of onset of SLE in the tumor-bearing group was 28 compared with 26 for the nontumor-bearing group. The median duration of SLE was 16.1 yr in the patients who developed tumors and 11 yr in the no-malignancy group. The median age at diagnosis of the malignancy was 43.5. Six of the eight patients who developed malignancies had been treated with corticosteroids; two of them had also received azathioprine.

3932 CELL-MEDIATED IMMUNOLOGICAL REACTIVITY OF PATIENTS AND SIBLINGS TO BLAST CELLS FROM ADULT ACUTE LEUKEMIAS. *(E.)* Anderson, P. N. (Dep. Med., Johns Hopkins Univ., Baltimore, Md.), D. L. Klein, W. B. Bias, G. M. Mullins, P. J. Burke and G. W. Santos. *Isr J Med Sci* 10(8):1033-1051, 1974.

Thirty-nine adult acute leukemia patients and 91 of their normal siblings (all adult but six) were studied for cell-mediated immune reactions to leukemic blasts using the mixed leukocyte culture assay, the indirect macrophage migration-inhibition factor assay, and the ^{51}Cr-release cell-mediated immunity cytotoxicity assay. HL-A nonidentical siblings responded to leukemic blasts in 44% of migration-inhibition factor assays and 46% of ^{51}Cr-release cell-mediated immunity cytotoxicity assays. HL-A identical siblings responded to leukemic blasts with a frequency of 84% in mixed leukocyte culture assay, 42% in the migration-inhibition factor assay, and 73% in the ^{51}Cr-release cell-mediated immunity cytotoxicity assay. Using the mixed leukocyte culture assay, no evidence could be found for stimulation due to normal blast antigens found in normal bone marrow. Production of blastogenic factors by mitomycin-treated leukemic blasts could not be demonstrated. Mixed leukocyte culture, migration-inhibition factor, and ^{51}Cr-release cell-mediated immunity cytotoxicity assay responses to autologous frozen-stored leukemic blasts were found when normal remission lymphocytes were tested. The data are consistent with the evidence that leukemia-specific antigens exist, and that cellular immune responses to these antigens occur with a relatively high frequency in leukemia patients and their siblings. The data demonstrating positive migration-inhibition factor and ^{51}Cr-release cell-mediated immunity cytotoxicity tests (tests measuring presensitization) in siblings are compatible with the hypothesis that acute leukemia is caused by an infectious agent such as an oncogenic virus.

3933 CELL-MEDIATED IMMUNE RESPONSE OF *IN VITRO* SENSITIZED LYMPHOCYTES TO ISOGENEIC METHYLCHLOANTHRENE-INDUCED TUMOR CELL LINES. *(E.)* Warnatz, H. (Univ. Hosp., Erlangen-Nurnberg, West Germany) and F. Scheiffarth. *Transplantation* 18(3):273-279, 1974.

Lymphocytes from C57BL mice were immunized *in vitro* to three transplantable methylcholanthrene (MCA)-induced tumor cell lines, and the lymphocyte-mediated destruction of isogeneic target cells as well as the production of migration inhibition factor were studied. The lymphocytes showed the most effective toxicity to the tumor cell line to which they were immunized *in vitro*. Phytomitogens [phytohemagglutin (PHA) and concanavallin (Con A)] significantly enhanced the *in vitro*-induced immune response; the enhancement was target cell-specific when submitogenic doses (0.1 µg or less) of PHA or Con A were used. Mitogenic doses of PHA further increased the cytotoxic activity of lymphocytes, but the response was not specific. Lymphocytes cultured with mitogenic doses of Con A were no more cytotoxic than those cultured with submitogenic doses. Migration inhibitory activity was observed only when 2% of the lymphocytes were mixed with peritoneal exudate cells from C57BL mice. Submitogenic but not mitogenic doses of PHA and Con A induced a significant rise in migration inhibitory activity of lymphocytes. Cross reactivity between the three MCA tumor cell lines was demonstrated in the cytotoxic assay, but the activity varied from line to line. The results suggest that common antigens are present on the different cell lines but are weak in comparison to the individual antigens of each cell line.

3934 PROPOSED MECHANISMS BY WHICH AUTOCHTHONOUS NEOPLASMS ESCAPE IMMUNE REJECTION. *(E.)* Coggin, Jr., J. H. (U. Tennessee, Dept. Microbiol., Knoxville), K. R. Ambrose, P. J. Dierlam and N. G. Anderson. *Cancer Res* 34(8):2092-2101, 1974.

Data collected in the autochthonous SV40 hamster sarcoma model system are presented that suggest SV40 tumor surface antigens appear early after infection of neonatal animals with this oncogenic virus. Cell-mediated immunity measured *in vitro* in the microcytotoxicity assay against SV40 tumor target cells was demonstrable throughout several months prior to tumor appearance and thereafter until the death of the animals. Antibody appeared early after the initial transformed cells were present but could never be detected during the several wks prior to the visible appearance of s.c. autochthonous tumors. Lymphocytes from animals bearing SV40 sarcomas were generally incapable of conferring protection against SV40 tumor challenge to normal syngeneic recipients, suggesting some additional functional impairment of antitumor cytotoxicity *in vivo*. The data collectively suggest that, early after the appearance of SV40 neoplasms, antibody inhibitory to the growth of tumor cells appears but is not cytotoxic. This antibody functions by restricting the initial growth of the tumor cells and perhaps serves to diminish tumor cell antigenicity. Cell-mediated immunity appears somewhat later but is obviously ineffective in destroying the tumor focus, as it grows slowly over many months and eventually metastasizes. Inhibitor, presumably circulating antigen released from the enlarging tumor mass, binds to circulating lymphocytes and inhibits their cytotoxicity against the spreading tumor. Thus the growth of the SV40-transformed cells, comprising the initial tumor focus, to a lethal, spreading cancer is permitted to occur because of a series of blocking and inhibitory events involving antibody initially, possibly antigen and antibody intermediately, and primarily antigen in the later stages of tumor progression.

3935 CELL-MEDIATED IMMUNITY TO A RETINOBLASTOMA TISSUE CULTURE LINE IN PATIENTS WITH RETINOBLASTOMA.

(E.) Char, D. H. (Natl. Cancer Inst., Bethesda, Md.), R. Ellsworth, A. S. Rabson, D. M. Albert and R. B. Herberman. *Am J Ophthalmol* 78(1): 5-11, 1974.

Venous blood lymphocytes from 14 patients with retinoblastoma (one with metastatic disease) and 11 control subjects were tested for cell-mediated immunity to antigens expressed on a tissue culture line derived from a human retinoblastoma. Compared with the controls, 11 of the retinoblastoma patients had significantly increased levels of cytotoxicity against the tissue culture line. The retinoblastoma patients did not differ from the controls in their cytotoxicity against a breast carcinoma cell line. A control patient who had undergone a radical mastectomy for breast carcinoma had a significantly elevated cytotoxicity against the breast carcinoma line but not against the retinoblastoma cell line. The cytotoxic effects against the retinoblastoma line of four control patients with diseases affecting the retina did not differ from those of the other controls. The data indicate that the retinoblastoma patients exhibited cell-mediated immunity against the antigens expressed on the retinoblastoma cell line. This cell-mediated immunity may have been directed against retinoblastoma tumor antigens, although common tissue antigens, virus-coded antigens, and fetal antigens cannot be excluded.

3936 ANTIGENIC INHIBITION OF CELL-MEDIATED CYTOTOXICITY AGAINST TUMOR CELLS.

(E.) Shellam, G. R. (Dep. Zool., Univ. Coll., London, England) and R. A. Knight. *Nature* 252:330-332, 1974.

The syngeneic transplantable Gross virus-induced lymphomas (C58NT)D and W/FuG-1 are rejected after s.c. injection in about 85% of adult W/Fu rats. Progressive, lethal tumor growth occurs following i.p. injection of (C58NT)D cells or following s.c. injection of either tumor in immunosuppressed rats. The effects of progressor, hyperimmune, and regressor sera on the cell-mediated immune response (CMI) of rats to these tumors were studied. All progressor sera significantly inhibited CMI in comparison with regressor sera. When sera were tested at dilutions of 1:10,000, augmentation of CMI was observed with hyperimmune and regressor sera, but not with progressor sera. Inhibition of CMI was also observed with cell-free tumor-associated antigens, including (C58NT)D extract, Gross and Moloney pseudotypes of murine leukemia virus (MuLV), formalin-treated noninfectious Gross MuLV, and viral group-specific p31 antigen. Inhibition by virus and viral antigens was virus-specific. Preliminary experiments suggest that the inhibition of CMI by cell-free tumor-associated antigens is at the level of the effector T cell, since the cytotoxicity of unfractionated immune spleen cells was inhibited 30% following preincubation with Moloney MuSV, while preincubation of target cells with antigen did not alter the cytotoxicity.

3937 ANTIINFLAMMATORY EFFECTS OF MURINE MALIGNANT CELLS.

(E.) Fauve, R. M. (Univ. Cell. Immunol., Coll. France, Paris), B. Hevin, H. Jacob, J. A. Gaillard and F. Jacob. *Proc Natl Acad Sci USA* 71(10):4052-4056, 1974.

The mechanism by which mouse teratocarcinoma cells bypass the host immunological surveillance system was investigated. Development of teratocarcinomas in mice injected with 2 x 10^6 tumor cells did not impair the immunization of the mice against *Listeria monocytogenes*. Even three wk after tumor cell injection, s.c. immunization with a nonvirulent *Listeria* strain (3 x 10^5 cells) was as efficient as in controls; this was demonstrated by the number of bacteria present in spleen and liver 48 hr after i.v. injection of a virulent strain (2.7 x 10^5 cells). Endotoxin injection (100 μg) 30 min prior to s.c. or i.p. injection of teratocarcinoma cells allowed tumor growth in allogenic mice despite immune stimulation. The mice exhibited tumors after 12 days and also the presence of tumor cells in peritoneal washings. In contrast to the absence of impaired systematic immunity, teratocarcinoma cells repulsed macrophages *in vitro*. This lack of interaction with macrophages was also found with Ml melanoma cells, lung tumor 3LL cells, and with trophoblast cells. *In vivo*, teratocarcinoma cells impaired local endotoxin-induced inflammation in allogenic mice. These cells and other malignant cells were able to produce a compound with a molecular wt between 1000-10,000, which prevented inflammatory reactions in mouse peritoneal cavities. These results suggest that mouse teratocarcinomas and other tumors bypass the host immunological surveillance system by at least two mechanisms: a di-ect toxic effect on macrophages and the release of ı inhibitor of inflammation. The possible relationhip between these properties of malignant cells and ne phsyiologic functions of trophoblasts are disussed.

938 IMMUNOMODULATION OF TUMOR GROWTH. *(E.)* Prehn, R. T. (Fox Chase Cent. Cancer Med. ci., Philadelphia, Pa.). *Am J Pathol* 77(1):119-122, 974.

vidence against the concept of immunologic surveilance is presented. First, spontaneous tumors have ittle or no capacity to induce a tumor-inhibiting ype of immune reaction. This peculiarity of sponaneous tumors is not a manifestation of immunologic urveillance since tumors that arise in immune-free nvironments also fail to arouse any significant umor-inhibiting response when tested in immunologially capable hosts. The early weak response to ascent tumors stimulates rather than inhibits their rowth, as shown by studies with immune lymphoid cells. ore conclusively, congenitally athymic nude mice ith no capacity for allograft rejection are not caner prone. A group of germ-free nude mice (40% of hich are now over 1 yr of age) has manifested only ne type of spontaneous tumor; they are exhibiting high incidence of lymphoreticular tumors, which redominates in human congenital immune deficiency tates. A lack of surveillance would be expected to esult in an increment in all types of tumors. mmunity may be of great importance in limiting the ctivity of oncogenic viruses, but probably seldom etermines whether or not an already transformed ell gives rise to a lethal cancer.

939 T CELL SUPPRESSION *IN VITRO*. I. ROLE IN REGULATION OF ANTIBODY RESPONSES. *(E.)* eldman, M. (Dep. Zool., Univ. Coll., London, England). *ur J Immunol* 4(10):660-666, 1974

uppression of the antibody response of spleen cells rom adult thymectomized, irradiated and bone marrow rotected mice (ATXBM) to donkey red cells and hapten rotein conjugates was studied *in vitro*. Suppression as obtained with supraoptimal numbers (10^6/culture) f activated T cells from the spleen of CBA mice and as found to have both an antigen-specific and a nonpecific component. Suppression did not depend on irect contact of T and B cells, as supernatants of ctivated T cells were just as inhibitory. Addition f macrophages to cultures containing supraoptimal umbers of T cells abolished the suppressive effect. oth T and B cells could be specifically suppressed, .e., rendered partially tolerant, by T cell supernaants. This tolerance occurred in the absence of dherent cells, in the presence of antimacrophage erum, or in the presence of very high concentrations f T cell supernatant. These results stress the imortance of the interaction between T cell superatants and macrophages. The nonspecific form of supression was also partly abrogated by macrophages, suggesting that it may be analogous to antigenic competition. The presence of homeostatic feedback loops, due to excess T cell function, is suggested. T cell products suppress the function of T cells, preventing the induction of further helper cells, and also suppress B cells directly; the balance between T cell suppression and cooperation is affected by macrophage function.

3940 IMMUNODEPRESSIVE ACTION OF ONCOGENIC VIRUS SA7(C8). *(E.)* Ageenko, A. I. (P. A. Gertsen Oncol. Sci. Res. Inst., Moscow, USSR), V. S. Erkhov and G. M. Sukhin. *Bull Exp Biol Med* 77(5):545-546, 1974.

The effect of monkey adenovirus SA7(C8) on the immunoreactivity of CBA mice to sheep RBC was determined by Jerne's test of the plaque-forming activity of spleen cells. The virus gave rise to immunodepression in adult CBA mice, but its effect depended on the time interval between injection of the virus and sheep RBC. Virus (0.1 ml i.v.) injected five days before immunization inhibited hemolysin production, while virus injected three days before or three days after immunization caused no significant change in the plaque-forming activity of spleen cells. Injection of SA7(C8) virus (0.1 ml s.c.) into newborn mice led to prolonged immunodepression with respect to hemolysins against sheep RBC; the inhibitory effect was particularly marked in the early stages of carcinogenesis but was still present on the 25th day of life. The immunodepressive effect of carcinogens is evidently due to their action on antigen-sensitive cells or on precursors of the antibody-forming cells, or to interference with interaction between these two cell types.

3941 HUMORAL IMMUNOSUPPRESSIVE SUBSTANCE IN MICE BEARING PLASMACYTOMAS. *(E.)* Tanapatchaiyapong, P. (Manhattan VA Hosp., New York, N.Y.) and S. Zolla. *Science* 186(4165):748-650, 1974.

The mechanism by which plasmacytomas (PC) depress the primary immune response to sheep RBC was investigated by determining the ability of normal spleen cells to produce antibody when enclosed in Millipore chambers and implanted in PC-bearing BALB/c mice. Chamber-enclosed normal spleen cells implanted in PC-bearing mice responded poorly to sheep RBC when compared with similar cells enclosed in chambers and implanted in normal mice or in mice with other lymphoid or nonlymphoid tumors. The ratio of antibody-forming cells to chamber-enclosed cells differed in normal and PC-bearing mice, suggesting that the immunocompetent cells within the chambers were failing to proliferate. The data indicate that PC-induced immune suppression may be mediated by a humoral factor. The severely depressed immune response in patients with multiple myeloma and in mice with PC may be due to excessive production of a chalone-like substance that shuts off cellular processes leading to development of antibody-producing cells.

3942 RADIOLABELED ANTITUMOR ANTIBODIES. I. ANTIBODY-SPECIFIC AND IMMUNOGLOBULIN-SPECIFIC BINDING SITES ON MOLONEY LYMPHOMA CELLS (LSTRA). *(E.)* Nord, S. (Stanford Med. Sch., Calif.) and I. L. Weissman. *J Natl Cancer Inst* 53(1):117-124, 1974.

A paired, radiolabeled immunoglobulin technique was used to show that LSTRA Moloney lymphoma cells may bind rat IgGa immunoglobulins at either antibody-specific (Fab) or immunoglobulin-specific (Fc) portions of the IgGa molecule. Fc-specific binding is inhibited in the presence of normal rat serum (NRS), whereas Fab-specific binding is not. Sodium dodecyl sulfate-polyacrylamide gel analysis of eluted radiolabeled anti-Moloney proteins (bound to LSTRA cells in the presence of NRS) revealed that the bound proteins were indeed immunoglobulins. The presence of an Fc receptor on a malignant lymphoma line was unexpected and may represent an important biologic marker for lymphoid cell subclasses.

3943 *IN VIVO* BLOCKING ACTIVITY AND THE BIOLOGICAL EFFECT OF IgG (7S-ANTIBODIES) ISOLATED FROM THE SPLEEN CELLS AND SERA OF MICE WITH PROGRESSIVE RAUSCHER LEUKEMIA. *(Rus.)* Ter-Grigorov, V. S. (L. A. Tarasevich Inst. Stand. Insp. Biomed. Prep., Moscow, USSR), S. Z. Dzagurov and B. I. Shevelev. *Biull Eksp Biol Med* 78(12):55-58, 1974.

BALB/c mice were infected either with Rauscher's virus alone or in combination with Freund's adjuvant. Heparinized plasma from BALB/c mice bearing Rauscher virus leukemia was injected i.v. (0.2 ml diluted 1:5-1:10) into 1.5 - 2.5 month-old C57BL/6 mice six days after i.p. injection of Freund's adjuvant (0.1 ml). Studies with these animals showed that IgG covering the surface of leukemia cells during the early stages of Rauscher's leukemia and identified in the eluates from the spleen of the infected mice blocked, in *in vivo* experiments, the cytotoxic effect of isologous and homologous 19 S-antibodies directed against the group-specific cell antigen of murine leukemias; serum 7S antibodies from infected mice produced a similar blocking effect. The blocking 7S-IgG antibodies isolated from both sources stimulated leukemogenesis in *in vivo* experiments.

3944 CAT'S BLOOD, A CLUE TO HUMAN LEUKEMIA. *(E.)* Anonymous. *New Scientist* 63(914):636, 1974.

Antileukemia virus antibodies have been discovered in mice. Of 13 mouse strains in one study, four produced a strong positive immune response to expressed leukemia viruses, six produced an intermediate response, and the rest produced a relatively small reaction. Although the three major antibody types (G, M, and A) were represented in the antibody response, the predominant one was G, indicating that the reaction was quite strong. These data provide reason to hope for the eventual development of early detection measures for human leukemia, or even the development of antileukemia immunization.

3945 PRECIPITATING ANTIBODIES TO CANINE LYMPHOSARCOMA-ASSOCIATED ANTIGENS. *(E.)* Winters, W. D. (U. California Sch. Med., Los Angeles), and H. D. Snow. *Am J Vet Res* 35(10):1333-1335, 1974.

Immunodiffusion (ID) techniques were used to survey sera from tumor-bearing and normal dogs for precipitating antibodies to antigens derived from five canine lymphosarcomas. A significant percentage of positive reactions was seen in the sera from lymphosarcoma-bearing dogs (42 to 65%), whereas none of the sera from normal canine donors or from dogs with adenocarcinoma were positive against the same antigen preparations. Reactions did not occur in assays of extracts from normal canine tissues against sera from tumor-bearing and normal canine donors. Common anti-lymphosarcoma antibodies were detected in serum specimens from lymphosarcoma-bearing dogs, and all tumor extracts were reactive with at least some of these sera. However, although some of the tumor-bearing canine sera contained antibodies to the five tumor antigenic extracts, other specimens showed less reactivity. Results of absorption studies indicate that the active antigenic components of the partially purified tumor extracts were located in membrane and/or soluble cell fractions.

3946 THE STUDY OF EMBRYONIC α-GLOBULIN AND SERUM PROTEINS IN CULTURED MURINE TUMOR CELLS. *(Rus.)* Basmadzhan, M. E. (Inst. Exp. Biol., Yerevan, SSSR). *Biull Eksp Biol Med* 77(10):84-86, 1974.

Cells from the continuous line of murine hepatoma XXIIa were cultured for three yr and were found to retain their ability to synthesize α-fetoprotein, embryonic α-globulin and serum proteins (albumin and transferrin). After three yr, the hepatoma cells retained their malignancy when injected into CSHA mice and embryonic α-globulin was detected in sera of these mice. Injection of these hepatoma cells into BALB/c and C57Bl mice produced tumors which later regressed spontaneously. Embryo-specific α-globulin was detected in the sera of these mice during tumor growth.

3947 REPORT OF Ig A, Ig D, Ig G AND Ig M SECRETING PLASMA CELLS IN CANCEROUS LYMPH NODES. *(E.)* Fontaine, M. (Nord Hosp., Marseille, France), P. Mercier and M. Mongin. *Biomedicine* 21(4):168-171, 1974.

The occurrence of IgA, IgD, IgG, and IgM secreting plasma cells in 21 cancerous lymph nodes (8 cervical, 6 thoracic, and 7 abdominal) and 21 control lymph nodes taken from the same anatomical sites was studied using an immunofluorescent staining technique. The control lymph nodes contained 78% IgG, 12% IgM, 9% IgA, and 1% IgD secreting plasma cells. In the cancerous lymph nodes, IgD secreting cells represented 44% of the plasma cells, while IgA secreting cells represented 30%, IgG secreting cells represented 12%, and IgM secreting cells represented 4%. In each case, the total number of fluorescent

lasmacytes was consistent with the amounts seen in
Giemsa stained imprints. The highest proportions of
IgD-secreting plasma cells were found in lymph nodes
irectly involved in the neoplastic process. In
most cases IgA and IgD, but not IgG and IgM, plasma-
ytes were found binding to the malignant cells. The
Sternberg-Reed cells in the Hodgkin's lymph nodes
lways carried surface IgD but no other immunoglo-
ulins. All of the metastatic testicular dysem-
ryoma cells of an invaded lymph node showed IgA
and IgD fluorescence, but not IgG or IgM fluorescence.
All other cancer-invaded lymph nodes contained all
our immunoglobulins. All lymphocytes from the
aracortical areas of most neoplastic lymph nodes
howed a homogeneous peripheral ring of IgD fluores-
ence, its intensity being proportional to the num-
er of IgD secreting plasma cells in the lymph node.

948 THE USE OF INDIRECT IMMUNOFLUORESCENCE
TEST TO STUDY THE ETIOLOGY OF HUMAN LEUKEMIA
N EXPERIMENTS WITH MONKEYS. *(Rus.)* Kokosha, L. B.
Inst. Exp. Pathol. Ther., Moscow, USSR), B. A. Lapin,
. I. Deichman and L. A. Iakovleva. *Vopr Virusol*
5):582-588, 1973.

ata were obtained on the specific surface antigen
resent on the leukocytes of speciosa and rhesus mon-
eys inoculated with blood from leukemia patients.
mmune sera used for indirect immunofluorescence tests
ere prepared by immunizing adult Syrian hamsters
ith white blood cells and plasma from healthy donors
nd patients with various froms of leukemia. Immuni-
ation of the hamsters was carried out by s.c. and i.
. injections of 10-100 x 10^6 white blood cells in
ml of plasma. The surface antigen was detected
ith sera of animals immunized with leukocytes from
eukemia patients, but not with antisera against
eukocytes from healthy human donors. Tests on ab-
orption of antileukemia sera by sheep erythrocytes,
y leukocytes and erythrocytes from healthy donors
nd leukemia patients, and by leukocytes from experi-
ental and control monkeys indicated that only leuko-
ytes from leukemia patients and the experimental
onkeys could significantly lower the specific acti-
ity of the antisera.

949 RADIOIMMUNE ASSAY FOR THE DIAGNOSIS OF HU-
MAN CANCER. *(E.)* Egan, M. L. (Dept. Im-
unol., City Hope Natl. Med. Ctr., Duarte, Calif.),
. E. Coligan and C. W. Todd. *Cancer* 34(4):1504-
509, 1974.

adioimmune assay techniques have recently achieved
ractical application in the diagnosis of some forms
f human cancer. A radioimmune assay consists of
e interaction of an antigen (Ag) with its cognate
ntibody (Ab) to form an antigen-antibody complex
Ag·Ab). The antigen is usually tagged by a radio-
ctive isotope so that the extent of the reaction
etween the antibody and the antigen can be measured.
ommonly, it is the antigen-antibody complex that
s measured, this step usually being preceded by
ome operation which causes the antigen-antibody
omplex to separate from solution. The amount of
ntibody to use relative to the amount of antigen
added can be established in two ways: sufficient tagged antigen can be added to saturate completely all the antibody combining sites present in the antiserum; or the antibody binding sites can be progressively filled. The sensitivity of the assay depends on the nature of the antiserum used, an antiserum being characterized in terms of its specificity for a given antigen, antibody titer, and affinity for the antigen. The best antibody affinity is elicited by immunization with small rather than large quantities of antigen. Materials which can interfere with the antigen-antibody combination and alter the result of the assay include complement, an enzyme which hydrolyzes the substrate, the improper reaction medium in terms of pH or salt concentration, and a material of related structure masquerading as the true antigen. Hopes that the radioimmune assay of carcinoembryonic antigen (CEA) could serve as a specific detection method for cancer have been dispelled by the finding that the materials to which the assay responds are present in a number of other malignant and nonmalignant diseases; furthermore, current knowledge of CEA is scanty. CEA is almost 40% protein and 60% carbohydrate; the latter includes sialic acid, fucose, glucosamine, galactose and mannose. Removal of sialic acid and fucose are followed by unaffected antigenic activity of CEA in the radioimmune assay. Elucidation of the structure may provide information leading to more specific diagnostic tests based on radioimmune assay procedures.

3950 DIFFERENTIAL LECTIN AGGLUTINATION OF FETAL, DIVIDING-POSTNATAL, AND MALIGNANT HEPATOCYTES. *(E.)* Becker, F. F. (New York Univ. Sch. Med., N.Y.). *Proc Natl Acad Sci USA* 71(11):4307-4311, 1974.

The agglutination of liver cells from normal adult and fetal ACI rats and from several malignant rat hepatomas was studied in the presence of concanavalin A (con A) (125-500 µg/ml). Normal adult rat hepatocytes prepared either by a phosphate-buffered saline-citrate homogenization technique, with or without trypsinization, or by collagenase digestion failed to agglutinate at any con A concentration. Regenerating adult hepatocytes in various stages of the cell cycle following 70% hepatectomy also failed to agglutinate. Fetal hepatocytes as well as hepatoma cells from five different rat tumors showed a strong agglutination response which was dependent on the concentration of con A used. The inability of dividing normal hepatocytes to agglutinate under conditions in which they synthesize α-fetoprotein suggests either that a partial expression of fetal characteristics is possible in these cells as in malignant hepatocytes or that con A agglutination is not solely related to expression of fetal characteristics.

3951 INHIBITION OF NATURAL TOLERANCE TO α-FETOPROTEIN IN RATS. *(Rus.)* Gusev, A. I. (N. F. Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR) and A. K. Iazova. *Biull Eksp Biol Med* 77(10):77-80, 1974.

An attempt was made to overcome the natural tolerance to α-fetoprotein (FP) in mice and rats. Wistar rats weighing 80-470 g and C3HA mice (18-22 g) were injected s.c. and i.m. with 0.1 ml of purified serum and FP isolated from pooled serum from of 1-3-day-old mice and rats by disk electrophoresis in a polyacrylamide gel. Two injections were made 28-30 days apart; the first, in combination with complete Freund's adjuvant, the second, without it. None of the 108 serum samples from rats or 23 samples from mice taken before immunization contained either FP or its antibodies. Tolerance in rats to homologus FP was overcome by the immunization with cross-reacting FP from mice, but not with homologous FP. The mice retained tolerance to FP after injection of both the homologous murine FP and heterologous rat FP. It is suggested that murine tolerance to FP is associated with the high natural level of FP in the blood of C3HA mice.

3952 NEW ANTIGENS IN CONTINUOUS CELL LINES AND HUMAN TUMORS. *(Rus.)* Korosteleva, V. S. (D. I. Ivanovskii Inst. Virol., Moscow, USSR), R. P. Pavliuchenkova, N. P. Kosiakova, S. A. Demidova and V. M. Zhdanov. *Vopr Virusol* (6):708-713, 1974.

Studies were carried out on the continuous lines of malignant cell cultures (HeLa, HEp-2 and J-96) and human tumor tissues (hepatic metastases of carcinomas of the esophagus, large intestine, stomach, pancreas and prostate). A comparative study was also conducted of the antigenic properties of other continuous human cell lines (Detroit-6, A1, FL, RH and Wisch), monkey cells, (kidney, tonsil, lymph nodes, and heart of various species), mouse L cells, and porcine embryonic kidney cells. The antigen of intracellular virus was prepared from HeLa, HEp-2 and J-96 cells. Normal adult and embryonic tissues were used as the controls. Continous lines of HeLa, HEp-2 and J-96 cells contained a common antigen which was not found in the adult or embryonic tissues and which differed from the viral antigens. An identical antigen was detected in other cells of human origin (Detroit-6 FL, A1, RH and Wisch), and a similar antigen was discovered in all of the monkey cell cultures investigated but not in murine L cells or porcine embryonic kidney cells. The new cell antigen common to humans and primates differed immunologically from the specific antigens of human cancer tumors.

3953 ISOLATION AND IDENTIFICATION OF SOLUBLE SKIN-REACTIVE MEMBRANE ANTIGENS OF MALIGNANT AND NORMAL HUMAN BREAST CELLS. *(E.)* Hollingshead, A. C. (Dep. Med., George Washington Univ., Washington, D.C.), W. T. Jaffurs, L. K. Alpert, J. E. Harris and R. B. Herberman. *Cancer Res* 34(11):2961-2968, 1974.

Patients with carcinoma of the breast had delayed hypersensitivity skin reactions to soluble membrane antigens of breast cancer and also to comparable antigens from control breast tissue. The skin-reactive antigens were further separated by gradient polyacrylamide gel electrophoresis, and the various gel regions were tested. Proteins from two adjacent gel regions (2a and 2b of Sephadex Fraction II) gave positive reactions, but they appeared to contain different antigens. One antigen (2b) was detected in breast cancer extracts and not in control breast extracts. It elicited reactivity in seven of eight patients with either localized or metastatic breast cancer and was negative with patients with other types of carcinoma. The other antigen (2a) was not a tumor-associated antigen but was present in extracts from both breast cancer and benign breast disease. This breast tissue antigen produced skin reactions in four of four patients with Stage I breast cancer but not in any of four patients with Stage IV breast cancer. Because of the suggestion of correlation with clinical stage, skin reactivity to Region 2a antigen, although not tumor specific, may be a useful parameter for serial monitoring of breast cancer patients.

3954 DIFFERENTIATION BETWEEN EARLY AND LATE MEMBRANE ANTIGEN ON HUMAN LYMPHOBLASTOID CELL LINES INFECTED WITH EPSTEIN-BARR VIRUS. II. IMMUNO-ELECTRON MICROSCOPY. *(E.)* Silvestre, D. (St. Louis Hosp., Paris, France), I. Ernberg, C. Neauport-Sautes, F. M. Kourilsky and G. Klein. *J Natl Cancer Inst* 53(1):67-74, 1974.

The specificity of Epstein-Barr virus (EBV)-associated membrane antigen (MA) on the membrane of cells replicating virus and on extracellular virus particles in EBV-producing human lymphoblastoid cell lines was studied by immunoelectron microscopy. The results corroborate immunofluorescence findings and support the assumption that cells replicating EBV express on their membrane a late MA (LMA) distinct from the early MA (EMA) detected on cells devoid of viral capsid antigen and early antigens. Anti-MA sera repeatedly absorbed with EBV-infected, cytosine arabinoside-treated Raji cells retained a residual activity for the membrane of virus-containing cells in the culture, as demonstrated by indirect immunoferritin labeling or direct immunoferritin methods with absorbed anti-MA ferritin conjugates. The specificity of the anti-LMA immunoferritin reaction was ensured by blocking experiments. The LMA and EMA were thus detected on the envelope of extracellular EB virions. Blocking of anti-MA ferritin conjugates with absorbed and unabsorbed anti-MA reagents indicated expression of both EMA and LMA on the membrane of cells replicating virus. By contrast, host-cell HL-A antigens, absent or barely detectable on the viral envelope, were readily detected on cells replicating EBV.

3955 ANTIGEN-REACTIVE CELLS IN THE SPLEEN OF MICE WITH METHYLCHOLANTHRENE-INDUCED SARCOMA. *(Rus.)* Iakimenko, L. V. (Inst. Oncol. Probl., Kiev, USSR) and Iu. A. Umanskii. *Biull Eksp Biol Med* 77(5):86-88, 1974.

Forty-six 4-5 month-old BALB/c mice were exposed to 700 rads. of gamma radiation and 1 hr later injected i.v. with a cell suspension containing 5 x 10^6 spleen cells from isologous donor mice bearing methylcholanthrene-induced sarcoma. The recipient mice were sacrificed four months later. Tests showed that in addition to a steady decrease of the number of antibody-forming cells by 6-6.5 times, the number of antigen-reactive cells, which are precursors of antibody formation, fell by 3-4 times. It is suggested that antigen-reactive cells are but one of the stages of antibody formation and are substantially affected by chemical carcinogenesis.

3956 THE ERYTHROBLAST ANTIGEN IN MICE WITH VIRAL LEUKEMIA. *(Rus.)* Ievleva, E. S. (N. F. Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR), N. V. Engelgardt and G. I. Abelev. *Biull Eksp Biol Med* 77(6):82-87, 1974.

Mice with Rauscher viral leukemia reveal an antigen different from the type- and group-specific antigens in terms of electrophoretic mobility and immunochemical specificity. The antigen was found in the sera and spleens of healthy mice of the C57BL/He, C57BL/10Sn, BALB/c and B10/D2 lines. It was not detected by immunofluorescent technique in erythrocytes or lymphocytes, but it was observed regularly on the surfaces of erythroblasts, hence the designation AG-EB. The new antigen is not identical with embryonic hemoglobin. It is suggested that AG-EB is a specific marker characteristic of a certain stage in the differentiation of erythroid cells.

3957 DISTRIBUTION OF FIBROBLAST SURFACE ANTIGEN. ASSOCIATION WITH FIBRILLAR STRUCTURES OF NORMAL CELLS AND LOSS UPON VIRAL TRANSFORMATION. *(E.)* Wartiovaara, J. (Dep. Third Pathol., Univ. Helsinki, Finland), E. Linder, E. Ruoslahti and A. Vaheri. *J Exp Med* 140(6):1522-1533, 1974.

The localization of a cell type-specific, soluble surface antigen (SFA) previously detected in chick embryo fibroblasts was studied by immunofluorescence and scanning electron microscopy. The antigen was unevenly distributed on cultured chick fibroblasts; it was localized to membrane processes and ridges that varied from 50-200 nm in diameter. The processes extended from the periphery of the cells to the substratum or to other cells. Trypsin treatment removed all detectable SFA, but the antigen reappeared within one hr after trypsin-treated cells were reseeded. Its reappearance correlated with the restoration of membrane processes. Fibroblasts transformed by Rous sarcoma virus (RSV) showed loss of all or most SFA. In cells transformed without subcultivation and trypsinization, a fibrillar extracellular network of SFA was detectable even though the cells themselves were negative in immunofluorescence. When fibroblasts infected by a temperature-sensitive RSV mutant were transferred to the nonpermissive temperature for transformation, new SFA was detected within two hr. These data suggest that loss of SFA molecules in fibrillar cell surface structures may be critical in altered growth control and malignant transformation.

3958 SEROEPIDEMIOLOGY OF HUMAN SARCOMA ANTIGEN (S_1). *(E.)* Hirshaut, Y. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.), T. Pei, R. C. Marcove, B. Mukherji, A. R. Spielvogel and E. Essner. *N Engl J Med* 291(21):1103-1107, 1974.

A previously identified tumor-associated antigen of human sarcoma, S_1, was studied to characterize further its association with neoplasia. The prevalence of S_1 antibody in 166 sera from normal persons and in 295 from patients with neoplasia was determined by an immunofluorescence test. The prevalence of antibody to S_1 in the normal population varied considerably with age. Thirty-nine (91%) of 43 persons aged 5-20 yr had serum anti-S_1 activity, whereas of 39 above age 41 only 13 (33%) were similarly reactive. Neoplasia may induce the reappearance of S_1 antibody. Significant antibody levels were found in more than 80% of patients with carcinoma of the breast, lung, and melanoma aged 41 yr or older. An inverse relation of antibody prevalence to extent of disease was noted in patients with Hodgkin's disease. Of 12 patients with early Hodgkin's disease, all had S_1 antibody compared with only four of 22 patients with advanced disease. Available data suggest that S_1 is a heterophil type of antigen. Although not tumor-specific, S_1 may prove useful both for the detection of neoplasia in older persons and for the evaluation of response to antitumor therapy.

3959 MODULATION OF EXPRESSION OF VIRUS-INDUCED TUMOR ANTIGENS *IN VIVO* AND *IN VITRO*. *(E.)* De Vaux Saint Cyr, C. (Inst. Res. Sci. Cancer, Villejuif, France). *Isr J Med Sci* 10(8):826-835, 1974.

The modulation of virus-associated tumor antigens was studied with a hamster fibroblast cell line, TSV_5Cl_2, originating from a simian virus 40-induced tumor in newborn hamsters. This cell line contains T antigen in the nucleus and cytoplasmic, or C, antigen. Ten days after s.c. injection of TSV_5Cl_2 cells (10^5), antibodies against both antigens were detected in the sera of 10 of 40 tumor-bearing animals; at 20 days the antibodies were present in the sera of all 40 animals. C antigen could not be demonstrated in excised tumors. Antisera absorbed with up to 70 mg lyophilized tumor tissue retained full antibody activity against the T and C antigens, whereas 20-30 mg lyophilized TSV_5Cl_2 cells from tissue culture completely absorbed the anti-C antibodies. Cultured tumor cells did not become positive for T and C antigens until day 4, when both antigens reappeared together. By the ninth day in culture, approximately 95% of the cells were antigen positive. Susceptibility of tumor cells to the cytotoxic activity of sera from hamsters bearing TSV_5Cl_2 tumors (HTS sera) was demonstrated after 6-9 days in culture. To determine the possible role of antibodies in the repression of antigen synthesis, 4-day-old cultures were grown in the following sera: 1) 10% calf serum (CS), 2) 5% CS + HTS, 3) 2.5% CS + 7.5% HTS, and 4) 10% HTS. Synthesis of T and C antigens was not inhibited by the presence of antibodies in the culture medium.

3960 ANTIGENIC MODULATION *IN VITRO*. I. FATE OF THYMUS-LEUKEMIA (TL) ANTIGEN-ANTIBODY COMPLEXES FOLLOWING MODULATION OF TL ANTIGENICITY FROM THE SURFACES OF MOUSE LEUKEMIA CELLS AND THYMOCYTES. *(E.)* Stackpole, C. W. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.), J. B. Jacobson and M. P. Lardis. *J Exp Med* 140(4):939-953, 1974.

The modulation or loss of thymus-leukemia (TL) antigenicity from the surface of mouse RADA1 leukemia cells and normal thymocytes during incubation with TL antibody *in vitro* at 37 C was investigated by cytotoxicity, immunofluorescence, and immunoelectron microscopy. The fate of bivalent and monovalent antibody during modulation was visualized by fluorescence microscopy. Considerable antibody remained bound to the cell surface modulation, bivalent antibody being displaced topographically into patches and caps while monovalent antibody was only slightly aggregated on the cell surface. Some antibody was internalized, presumably by pinocytosis, and was sequestered into the Golgi region of the cell. Capping usually occurred over the pole of the cell opposite from the Golgi region, which may explain the lack of extensive pinocytosis of modulating bivalent antibody. Since modulation with monovalent antibody occurs without patch or cap formation, gross topographical redistribution of TL antigen-antibody complexes is not required for modulation, although more subtle displacement of these complexes may be involved. Modulation was demonstrable by cytotoxicity with guinea pig C' but not absorbed rabbit C', indicating that modulated TL antigens remain bound to the cell surface. A heat-labile factor present in TL antiserum and mouse serum in general was essential for the demonstration of modulation with guinea pig C'. Further elucidation of the mechanisms involved in *in vitro* modulation of TL antigenicity may contribute to an understanding of the organization of the cell surface.

3961 HL-A ANTIGENS AND SUSCEPTIBILITY TO MALIGNANT HEMATOLOGICAL DISEASE.

(Ger.) Richter, K. V. (Dist. Blood Bank Transfus. Stn., Berlin, Germany), G. Fischer, G. R. Menzel, M. Langfeld, H. Aigte, G. Ruckwarth and G. Freier. *Haematologia (Budap)* 7(2):203-209, 1973.

The frequency of 20 HL-A antigens (HL-A 1, 2, 3, 9, 10, 11, 28 of the LA series, and HL-A 5, 7, 8, 12, 13, 14, 17, 27, W 10, W 22, W 15, W 5, and W 18 of series 4) was determined in 90 patients with leukemia or Hodgkin's disease in an attempt to establish relationship between the HL-A antigen frequency and the susceptibility to malignant hematological diseases. The results were compared with the distribution of HL-A antigens in 600 normal controls. W 18 was the only antigen to be significantly more frequent in patients with chronic lymphatic leukemia than in the controls, and the frequency of HL-A 9 was significantly increased in patients with Hodgkin's disease. There was a significantly increased frequency of the haplotypes HL-A 2, 18, 3, and 13, and a decreased frequency of the haplotype HL-A 1, 8 in the patients. The contradictory results of other authors may be due to methodology, e.g. difficulties in serological identification of the HL-A system, and in the heterogeneity of the patients tested.

3962 ACUTE LYMPHOBLASTIC LEUKAEMIA AND HL-A: A PROSPECTIVE STUDY.

(E.) Klouda, P. T. (R. Marsden Hosp. Inst. Cancer Res., London, England), S. D. Lawler, M. M. Till and R. M. Hardisty. *Tissue Antigens* 4(3):262-265, 1974.

Sixty newly-diagnosed cases of childhood acute lymphoblastic leukemia (ALL) were HL-A typed within 28 days of diagnosis; at this time the patients were in remission. All of the children were caucasians from the Greater London area. A nonsignificant decrease in the frequency of the W27 antigen was found, in contrast to a previous study in which the frequency of this antigen was elevated among 58 English children suffering from ALL. Again in contrast to the previous study, the frequency of the HL-A9 antigen was significantly reduced in the children of the present study. Among the previous 58 patients, those with the HL-A9 antigen had a longer mean survival time. The data suggest that the HL-A9 antigen may be associated with both a diminished susceptibility to ALL in childhood and a better prognosis in those children who develop the disease.

3963 LEUKAEMIA ANTIGENS: MIXED LEUCOCYTE CULTURE TESTS ON TWELVE LEUKAEMIC PATIENTS WITH IDENTICAL TWINS.

(E.) Fefer, A. (Dep. Med., Univ. Washington, Seattle), E. Mickelson and E. D. Thomas. *Clin Exp Immunol* 18(2):237-242, 1974.

Peripheral blood leukocytes from 12 leukemic patients and their normal genetically identical twins were studied in one-way mixed leukocyte culture tests. In no case did normal twin cells stimulate the patient cells, nor did cells from nine patients with leukemia (one acute lymphoblastic, four acute myeloblastic, two chronic myelogenous leukemia in blast crisis, and two lymphosarcoma-leukemia) stimulate their normal twin cells. However, peripheral blood leukocytes from two patients with acute lymphoblastic and one with acute myeloblastic leukemia significantly stimulated the lymphocytes of their normal twins. Cells from two of the latter three patients stimulated unrelated lymphocytes more than did cells from the corresponding normal twins. The results suggest the existence of new or modified antigens on leukemia cells recognizable by cells from normal individuals who never had detectable leukemia.

3964 PRESENCE OF CHRONIC LYMPHOID LEUKAEMIA ASSOCIATED ANTIGEN IN OTHER MALIGNANT HAEMATOLOGICAL DISEASES.

(E.) Phan, D. T. (Natl. Inst. Haematol. Blood Transfusion, Budapest, Hungary). G. G. Petranyi and S. R. Hollan. *Vox Sang* 26(2): 141-146, 1974.

Absorbed specific antiserum was applied for detecting the presence of chronic lymphoid leukemia-associated antigen on the lymphocytes from 60 patients with chronic lymphoid leukemia, 8 patients with acute lymphoid leukemia, 10 with lymphosarcoma, 12 with reticulosarcoma, 11 with Hodgkin's disease, 7 with multiple myeloma, and 4 with Waldenstrom's macroglobulinemia. The absorbed antisera were highly reactive with cells from 60/60 patients with chronic lymphoid leukemia, 5/5 patients with acute lymphoid leukemia, and 7/10 patients with lymphosarcoma. The lymphocytes of three acute lymphoid leukemia patients in the phase of remission failed to react with the absorbed specific antiserum. The absorbed antisera did not exhibit cytotoxic activity against lympho-

ytes from other types of malignant lymphoma,
gainst those from patients with acute and chronic
yeloid leukemia, and against T and B lymphocytes
rom normal donors.

965 THE PROPERDIN AND COMPLEMENT ACTIVITY IN PATIENTS WITH GASTRIC CANCER.

(Rus.) Lok-
atiuk, A. S. (Tomsk Med. Inst., USSR), E. S. Smolian-
nov, N. P. Kazantsev and L. Ia. Nemirovskaia. *Vopr*
nkol 20(11):22-25, 1974.

ne content of properdin and complement was studied
n 105 patients with gastric cancer and 39 normal
ontrols. Patients were divided into six groups: (1)
3 terminal cancer patients, (2) 32 third stage pre-
perative patients, (3) 32 patients soon after rad-
cal surgery, (4) 11 patients who had undergone surg-
ry as long as one yr before, (5) 11 patients who had
ndergone surgery one to three yr before, and (6) 11
atients five or more yr after surgery. The properdin
nd complement content was significantly lower in all
roups of patients with gastric cancer than in the
ontrols. The greatest decrease was observed in
roup (3) (properdin, 12.6 ± 1.0 M; complement, 0.16
0.04 M). During the first three yr after surgery
ne properdin and complement content increased mod-
rately, while after five yr it was significantly
ecreased. The complement content tended to decrease
s the cancer progressed. In both patients and con-
rols, the properdin content decreased with age,
nile the complement content increased.

966 INCREASED BINDING OF CONCANAVALIN A TO INTERFERON-TREATED MURINE LEUKEMIA L 1210

ELLS. *(E.)* Huet, C. (Inst. Sci. Res. Cancer, Vil-
ejuif, France), I. Gresser, M. T. Bandu and P. Lin-
nhl. *Proc Soc Exp Biol Med* 147(1):52-57, 1974.

ne binding of concanavallin A (Con A) to untreated
nd interferon-treated mouse lymphoid leukemia L
210 cells was compared. Cultivation of L 1210 cells
r 48 hr with mouse interferon (1600 U/ml) signifi-
ntly increased ^{63}Ni-Con A binding compared with
nding in untreated cultures. In a series of nine
xperiments, the range of ^{63}Ni-Con A binding to inter-
eron-treated cells at 48 hr of cultivation was 4.2-
1 μg (mean 4.97 μg) per 2 X 10^6 cells, whereas the
nge of ^{63}Ni-Con A binding to untreated cells was
72-3.28 μg (mean 2.53 μg) per 2 X 10^6 cells. Inter-
eron preparation derived from mouse C-243 or L cells
mouse brain were all effective, as was a highly
rified mouse cell culture interferon. No increase
Con A binding occurred when L 1210 cells were cul-
vated with inactivated mouse interferon preparations,
bbit cell interferon, or highly purified human
terferon, nor was increased binding observed when
interferon-resistant L 1210 subline was treated
th mouse interferon. Electron microscopic examin-
ion of L 1210 cells cultivated with peroxidase-
beled Con-A showed the presence of the label on the
ell surface of both untreated and interferon-treated
ells. Interferon-treated cells exhibiting an in-
reased binding of Con A were far less tumorigenic
r DBA/2 mice than were untreated L 1210 cells.
ese results indicate that interferon treatment of
1210 cells is accompanied by modifications of the
cell surface which can be detected by an increased binding of Con A to the cell surface.

3967 THE FORMATION OF INTERFERON IN BONE MARROW CULTURES AND PERIPHERAL BLOOD CELLS IN PATIENTS WITH HODGKIN'S DISEASE.

(Rus.) L'vovskii, E. A. (Cent. Res. Inst. Roentgenol. Radiol., Leningrad, USSR), P. N. Kiselev, E. V. Tendler, N. K. Tokarevich, and I. L. Turbina. *Vopr Onkol* 20(10):84-85, 1974.

Studies were conducted on the effect of Newcastle disease virus and *Salmonella typhi* endotoxin on the formation of interferon in peripheral blood cells and bone marrow cultures from 23 patients with Hodgkin's disease and from 8 healthy donors. Cultures treated with endotoxin (50 μg/ml) were incubated at 37 C for 2 hr and cultures with virus (0.2 x 10^8 ID_{50} for chick embryos), 4 hr. Peripheral blood cultures from normal donors responded to Newcastle disease virus infection with the production of highly active interferon (160-640 U/ml), while *S. typhi* endotoxin increased interferon activity in peripheral blood cultures of controls to 40-80 U/ml. Endotoxin stimulated the formation of interferon in the bone marrow culture but not in the peripheral blood cells, of the Hodgkin's disease patients (320-640 U/ml). The virus failed to stimulate formation of interferon in either the peripheral blood cells or the bone marrow of patients. Thus, endotoxin stimulates interferon production in the bone marrow of patients with Hodgkin's disease regardless of the immunological defect in lymphoid hematopoiesis.

3968 MIXED LYMPHOCYTE REACTIVITY OF PATIENTS WITH SOLID TUMORS.

(E.) Harris, J. (Dep. Med., Univ. Ottawa, Canada) and T. H. M. Stewart. *Oncology* 30(1):33-42, 1974.

The mixed lymphocyte reactivity of 22 non-lymphoid solid tumor patients was studied prior to chemotherapy using the one-way (mitomycin-inactivation) assay. All patients studied had disease disseminated beyond the primary site of origin. Each patient was paired with a healthy control subject. The mixed lymphocyte reaction studies were set up in 13 x 100 mm glass tubes containing 1 ml of either patient or control plasma. Responding cells were used in a final concentration of 5 x 10^5 cell/3 ml 13 x 100 mm culture tube. Stimulator cells were treated with 20 μg/ml mitomycin C for 30 min at 37 C, washed, and added to the culture tube in a concentration of 5 x 10^5 cells/tube. For each patient investigated, one-way studies were performed with first the patient and then the control providing the stimulator cells. The cultures were incubated for five days in 5% CO_2 at 37 C. They were harvested and processed for liquid scintillation counting following a final three hr incubation with 2 μCi ^{3}H-thymidine. In 21/22 one-way studies the responses of control cells in control plasma against patient cells were greater than the response of patient cells against control cells in patient plasma. When cultured in control subject plasma, seven patients gave a better response than when cultured in autologous plasma. In 11 one-way studies, the responses of control subject lymphocytes to patient lymphocytes were depressed on culture in patient plasma when compared to results obtained when cultured in control subject plasma. It is concluded that solid tumor patients with advanced disease may have impaired mixed lymphocyte reactivity and that in some instances this depressed lymphocyte function may be due to a plasma factor.

3969 IMMUNOLOGICAL ENHANCEMENT OF TUMOR GROWTH BY SYNGENEIC THYMUS-DERIVED LYMPHOCYTES.

(E.) Umiel, T. (Weizmann Inst. Sci., Rehovot, Israel) and N. Trainin. *Transplantation* 18(3):244-250, 1974.

The role of lymphoid cells in the development of a transplanted syngeneic Lewis lung tumor (3LL) was investigated. Spleen cells from tumor-bearing mice or from intact controls were mixed with tumor cells (2×10^5 at different lymphocyte to tumor ratios (5:1, 10:1, 100:1) and transferred s.c. to intact C57BL/6J mice. Recipients of spleen cells from 3LL tumor-bearing mice had a significantly higher incidence of tumor takes (100% *versus* 50-70%) and a significantly higher number of lung metastases than recipients of spleen cells from nontumor-bearing mice. In addition, tumors appeared earlier in mice injected with tumor cells and lymphoid cells in a ratio of 100:1. To identify the lymphoid population involved in tumor enhancement, thymectomized, irradiated mice were injected with thymocytes (5×10^7) or bone marrow cells (3×10^7) from syngeneic intact mice prior to tumor challenge. The number of lung metastases rose significantly in mice injected with thymocytes but not in mice injected with bone marrow cells, indicating that enhancement of tumor growth was mediated by thymocytes or thymus-derived lymphocytes. This stimulation of tumor growth could be adoptively transferred to intact mice. Mice thymectomized before tumor challenge showed a significant reduction in the percentage of tumor takes and a slower rate of tumor development. The enhancing effect of lymphocytes from mice bearing 3LL tumors was apparently specific as lymphocytes sensitized to these tumors did not accelerate the growth of a different syngeneic tumor.

3970 HAIRY CELL LEUKEMIA: PROLIFERATION OF A CELL WITH PHAGOCYTIC AND B-LYMPHOCYTE PROPERTIES.

(E.) Fu, S. M. (Rockefeller Univ., New York, N.Y.), R. J. Winchester, K. R. Rai and H. G. Kunkel. *Scand J Immunol* 3(6):847-851, 1974.

Mononuclear cells from four patients with hairy cell leukemia were studied by immunofluorescence to detect phagocytic and B-lymphocyte properties. All hairy cells bore surface immunoglobulin. In two cases, only IgD was detected on the cell surface, whereas both IgM and IgD were present in the other two cases. After adsorbed IgG was removed by overnight culture, only one class of light chains was detected. Most of the hairy cells identified under phase contrast examination ingested latex particles. These findings suggest that hairy cell leukemia is caused by a monoclonal proliferation of immunoglobulin-bearing cells analogous to those in chronic lymphocytic leukemia. It is concluded that the hairy cells are B lymphocytes with phagocytic potential.

3971 THE ULTRASTRUCTURE OF THE LOCAL LYMPHORETICULAR RESPONSE TO AN EXPERIMENTAL NEOPLASM.

(E.) Carr, I. (Univ. Hosp., Sheffield, England), C. E. Underwood, F. McGinty and P. Wood. *J Pathol* 113(3):175-182, 1974.

The ultrastructure of a transplantable rat tumor (Rd/3), originally induced with dibenzanthracene, was studied in albino rats injected in the footpad with a critical dose of Rd/3 cells (50,000 cells) and in animals locally immunized with a high dose of formalized tumor cells (500,000 cells). Local pretreatment markedly retarded tumor growth, but critical dose tumors and tumors from immune pretreated animals showed essentially similar features. In both circumstances the tumor was infiltrated with macrophages and lymphocytes. The macrophages were long and flattened, and wrapped processes around tumor cells and ingested them. The lymphocytes were generally larger and less mature and showed small processes which invaginated tumor cells. The first phenomenon has not been seen in human tumors and the second has been observed only once. Tumor cell death occurred more often in the animal tumors. Although the migration-inhibition tests showed that cellular immunity was operating during tumor growth in pretreated animals, immunofluorescence gave no evidence of the presence of immunoglobulins in the neoplasms. Pretreatment apparently ensured the local presence of immunologically competent cells which subsequently reacted on injection of liver tumor cells. It is suggested that lymphocytes may play an indirect role in the phagocytosis of tumor cells by macrophages.

3972 IMMUNOLOGICAL REACTIVITY IN MALIGNANT MELANOMA. I. PHA STIMULATION AND ROSETTE FORMATION IN CIRCULATING LYMPHOCYTES FROM PATIENTS WITH DIFFERENT STAGES OF MELANOMA.

(Ger.) Bickhardt, R. (Dermatol. Clin., Univ. Freiburg/Breisgau, Germany) and J. Kunze. *Z Haut Geschlechtskr* 49(8):315-333, 1974.

Phytohemagglutinin (PHA) stimulation and rosette formation were studied in circulating lymphocytes from 49 melanoma patients, and membrane immunofluorescence tests were performed with sera from these patients to detect tumor-specific antibodies. The PHA lymphocyte stimulation test revealed a stimulation index of 28.6 in patients with histologically confirmed melanoma, as compared with 59.9 in a control group. Reduction of the lymphocyte reactivity was gradual and paralleled exacerbations in the clinical course of the disease and surgical and cytostatic therapy. The rosette formation test demonstrated that the number of circulating T-lymphocytes tended to decrease with the progression of metastases. Membrane fluorescence tests on monolayer cultures of melanoma cells (cell lines HKF-1A, HKF-1B, NKI-4, or NKI-8A) gave a positive reaction with at least one cell line in 46.9% of all cases. The titers ranged from 1:4 to 1:64. Serological status did not conform to the clinical stage of the disease. However, follow-ups in four cases showed that the membrane tests became negative as the tumor progressed and, in one case, with combined chemotherapy. In the latter case, tumor-specific membrane antibodies disappeared while the number of immunocompetent T-lymphocytes in the blood remained essentially the same.

3973 EXPRESSION OF HUMAN T AND B LYMPHOCYTE CELL SURFACE MARKERS ON LEUKAEMIC CELLS. *(E.)* Brown, G. (Imperial Cancer Res. Fund, Univ. Coll., London, England), M. F. Greaves, T. A. Lister, N. Rapson and M. Papamichael. *Lancet* (7883):753-755, 1974.

A panel of seven cell-surface markers that discriminate between T and B lymphocytes was used to study the cell-surface characteristics of human leukemic cells. The markers included rabbit antibrain, pig antithymus, E (sheep) rosettes, rabbit anti-Ig, rabbit anti-chronic lymphatic leukemia, erythrocyte antibody complement rosettes, and aggregated Ig. Four of 22 acute lymphoblastic leukemias had T-cell surface phentotype, the remaining 18 lacked all seven markers. One of 11 chronic lymphatic leukemias expressed T-cell markers, one lacked all markers, and the other nine had B-cell surface characteristics. Non-lymphoid leukemia, including myeloid (acute and chronic), erythroid, and myelomonocytic types, did not react with six markers but did bind antibrain antibodies. Further cell-surface phenotyping of leukemias and lymphomas may aid diagnosis and eventually therapy and prognosis.

3974 THYMUS AND MEDULLARY ORIGIN OF LEUKEMIC LYMPHOID CELLS IN ACUTE LEUKEMIA IN CHILDREN. *(Rus.)* Sokolov, P. P. (P. A. Gertsen Inst. Oncol, Moscow, USSR) and T. A. Izotova. *Pediatriia* (12):45-48, 1973.

Immunofluorescent studies were conducted on surface immunoglobulins of thymus-dependent (T-lymphocyte) and medullary (B-lymphocyte) cellular populations in six children with acute leukemia. The findings indicated that in the patients with acute leukemia (lymphoblastic and lymphoreticular forms) no more than 1.6% of the blast cells of peripheral blood carried IgM on their surface, while no IgA or IgM was observed. If the classification of lymphocytes into T and B cells is true of human lymphocytes, it is suggested that the cases under study point to pathology of T-lymphocytes. It is also possible that B-lymphocytes lose their surface Ig during malignant transformation.

3975 IMMUNODEPRESSIVE ACTION OF ONCOGENIC SA7(C8) VIRUS. *(Rus.)* Ageenko, A. I. (P. A. Gertsen Inst. Oncol., Moscow, USSR), V. S. Erkhov and G. M. Sukhin. *Biull Eksp Biol Med* 77(5):79-81, 1974.

3976 ANTIGEN EXPRESSION ON TUMOR CELLS DERIVED FROM FRIEND VIRUS INFECTED BALB/c SPLEENS. *(E.)* Freedman, H. A. (Albert Einstein Coll. Med., Bronx, N.Y.), F. Lilly and R. A. Steeves. *Proc Am Assoc Cancer Res* 15(March):131, 1974.

3977 SERUM ALPHA-FETOPROTEIN CONCENTRATION IN HEPATOMA IN THE UNITED STATES. *(E.)* Kithier, K. (Wayne State U., Detroit, Mich.), J. Belamaric, M. Al-Sarraf and V. K. Vaitkevicius. *Proc Am Assoc Cancer Res* 15(March):142, 1974.

3978 CHARACTERIZATION OF CARCINOEMBRYONIC ANTIGEN (CEA) IN THE PLASMA AND TUMORS OF PATIENTS WITH OVARIAN CANCER. *(E.)* Pletsch, Q. A. (Univ. Kentucky Med. Ctr., Lexington), J. R. Van Nagell, Jr. and D. M. Goldenberg. *Proc Am Assoc Cancer Res* 15(March):146, 1974.

3979 GLYCOLIPID MEDIATED IMMUNE REJECTION OF EXPERIMENTAL TUMORS. *(E.)* Lallier, R. (Dept. Cell Biol., U. Sherbrooke, Quebec, Canada), V. N. Nigam and C. Brailovsky. *Proc Am Assoc Cancer Res* 15(March):147, 1974.

3980 IMMUNOLOGICAL STUDIES IN BREAST CANCER. *(E.)* Lentino, J. A. (William Beaumont Army Med. Ctr., El Paso, Tex.). *Proc Am Assoc Cancer Res* 15(March):160, 1974.

3981 T AND B ROSETTE FORMING LYMPHOCYTES OF CANCER PATIENTS. *(E.)* Smith, R. A. (Mt. Sinai Hosp. Med. Ctr., Chicago, Ill.) and E. Z. Ezdinli. *Proc Am Assoc Cancer Res* 15(March):171, 1974.

3982 TISSUE SPECIFIC ANTIGENS IN MALGNANT AND HYPERPLASTIC HUMAN PROSTATES. *(E.)* Kent, J. R. (VA Hosp., Long Beach, Calif.), H. Labitzke and M. Hill. *Proc Am Assoc Cancer Res* 15(March):185, 1974.

3983 PROSPECTIVE EVALUATION OF CARCINOEMBRYONIC ANTIGEN (CEA) IN CLINICAL SETTING. *(E.)* Go, V. L. W. (Mayo Clin., Rochester, Minn.), M. Ravry, W. F. Taylor, A. J. Schutt and C. G. Moertel. *Proc Am Assoc Cancer Res* 15(March):194, 1974.

3984 EFFECT OF SOLUBILIZED MEMBRANE ANTIGENS AND TUMOUR BEARER SERUM ON TUMOUR GROWTH IN SYNGENEIC HOSTS. *(E.)* Forni, G. (U. Torino, Sch. Med. Italy) and P. M. Comoglio. *Br J Cancer* 30(4):365-369, 1974.

3985 INDEPENDENCE OF LEUKEMOID POTENTIAL AND TOXIGENICITY OF *MYCOPLASMA FERMENTANS.* *(E.)* Gambridge, M. G. (Dept. Microbiol., U. Illinois, Urbana) and D. D. Gamble. *J. Infect Dis* 130(6):664-668, 1974.

3986 IMMUNOLOGICAL STUDY OF CEA AND A RELATED ANTIGEN. *(E.)* Darcy, D. A. (Inst. Cancer Res., Sutton, Surrey, England). *Ann Immunol Ann Inst Pasteur (Paris)* 124 C, 595, 1973.

3987 COMBINATION OF CARCINOEMBRYONIC ANTIGEN AND GAMMA GLUTAMYL TRANSPEPTIDASE IN THE STUDY OF THE EVOLUTION OF COLORECTAL CANCER. *(E.)* Steele, L. (Dept. Exp. Path. Cancer Res., U. Leeds, England), E. H. Cooper, A. M. Mackay, M. S. Losowsky and J. C. Goligher. *Br J Cancer* 30(4):319-324, 1974.

3988 CIRCULATING TUMOR ANTIGENS *VERSUS* IMMUNE SERUM FACTORS IN DEPRESSED CONCOMITANT IMMUNITY. *(E.)* Vaage, J. (Pondville Hosp., Walpole, Mass.). *Cancer Res* 34(11):2979-2983, 1974.

3989 ESCAPE OF TA3 TUMORS FROM ALLOGENIC IMMUNE REJECTION. *(E.)* Grohsman, J. M. (Temple U., Philadelphia, Pa.). *Diss Abst Int B* 35(6): 2840-B, 1974.

3990 MITOCHONDRIA, AUTOIMMUNITY, AND ONCOGENESIS. *(E.)* Hickman, J. A. (Sch. Pharm., Liverpool Polytechnic, London, England). *Lancet* II(7896): 1579, 1974.

3991 THE THREE-DIMENSIONAL STRUCTURE OF THE Fab' FRAGMENT OF A HUMAN MYELOMA IMMUNOGLOBULIN AT 2.0-Å RESOLUTION. *(E.)* Poljak, R. J. (Johns Hopkins U. Sch. Med., Baltimore, Md.), L. M. Amzel, B. L. Chen, R. P. Phizackerley and F. Saul. *Proc Natl Acad Sci USA* 71(9):3440-3444, 1974.

3992 THE EFFECT OF PLASMACYTOMA RNA ON SURFACE IMMUNOGLOBULIN OF LYMPHOCYTES. *(E.)* Melnyczenko, W. I. (U. Illinois Med. Cent., Urbana). *Diss Abst Int B* 35(6):2842-B, 1974.

3993 *IN VITRO* RECOVERY OF CELL-MEDIATED IMMUNITY TO PARA-7 TUMOR CELLS. *(E.)* Lausch, R. N. (Sch. Med., Pennsylvania State U., Hershey) and D. Laux. *J Reticuloendothel Soc* 15(6):69a, 1974.

3994 LOCALIZATION OF ^{125}I-OPSONIC PROTEIN IN INJURED TISSUE FOLLOWING SURGERY: ITS SIGNIFICANCE TO HOST RESISTANCE TO CIRCULATING MALIGNANT CELLS. *(E.)* Kaplan, J. E. (Albany Med. Coll., N.Y.) and T. M. Saba. *J Reticuloendothel Soc* 15(6):68a, 1974.

3995 RAPID MLC TEST APPLICABLE TO CADAVERIC RENAL ALLOTRANSPLANTATION. *(E.)* Sakai, S. (U. Texas Med. Branch, Galveston), H. E. Sarles, A. R. Remmers, Jr., J. C. Fish and S. E. Ritzmann. *J Reticuloendothel Soc* 15(6):62a, 1974.

3996 HUMAN MONOCYTE METABOLISM IN LYMPHOMA: MALE *VS* FEMALE. *(E.)* King, G. W. (Dept. Med., Ohio State U., Columbus), A. F. LoBuglio and A. L. Sagone. *J Reticuloendothel Soc* 15(6):52a, 1974.

3997 LEUKEMIA VIRUSES AND CELL-MEDIATED IMMUNITY: EFFECTS ON CELL-MEDIATED CYTOTOXICITY. *(E.)* Mortensen, R. F. (Dept. Microbiol., Pennsylvania State U., University Park), W. S. Ceglowski and H. Friedman. *J Reticuloendothel Soc* 15(6):30a, 1974.

3998 THE HUMORAL AND CELLULAR IMMUNE RESPONSE TO AN ETHER EXTRACT OF 'HERPESVIRUS HOMINIS' TYPES 1 AND 2 IN GUINEA PIGS AND RABBITS. *(E.)* Zaia, J. A. (Ctr. Disease Control, Atlanta, Ga.). *J Reticuloendothel Soc* 15(6):27a-28a, 1974.

3999 NASOPHARYNGEAL CARCINOMA. VII. B AND T LYMPHOCYTES IN THE CIRCULATING BLOOD AND IN TUMOUR TISSUE. *(E.)* Yata, J. (Natl. Agency Res. Cancer, Villejuif, France), C. Desgranges, G. De-The, N. Mourali, R. Ellouz, T. Tachibana and J. Brugere. *Biomedicine* 21(6):244-250, 1974.

4000 NUCLEOTIDE SEQUENCE ANALYSIS OF RNA SYNTHESIZED FROM RABBIT GLOBIN COMPLEMENTARY DNA. *(E.)* Poon, R. (Dept. Biol. Mol. Biol Inst., , U. California, Los Angeles), G. V. Paddock, H. Heindell, P. Whitcombe, W. Salser, D. Kacian, A. Bank, R. Gambino and F. Ramirez. *Proc Natl Acad Sci USA* 71(9):3502-3506, 1974.

4001 EXCESS IgD BEARING LYMPHOCYTES IN PATIENTS WITH MALIGNANT MELANOMA. *(E.)* Malka, S. (Westminster Hosp., London, England), C. J. Oon and J. R. Hobbs. *Br J Cancer* 30(5):379-381, 1974.

4002 AN AMINO ACID DELETION ASSOCIATED WITH THE IgG4b ALLOTYPE OF HUMAN IgG4 MYELOMA PROTEINS. *(E.)* Abel, C. A. (Natl. Jewish Hosp., Res. Ctr., Denver, Colo.) and J. P. Despont. *J Immunogenet* 1:79-82, 1974.

4003 PAUL-BUNNELL-DAVIDSOHN ANTIBODY OF INFECTIOUS MONONUCLEOSIS AND EPSTEIN-BARR VIRUS. *(E.)* Springer, G. F. (Evanston Hosp., Ill.) and J. C. Adye. *Naturwissenschaften* 61(2):84-88, 1974.

4004 EFFECTS OF HYDROCORTISONE ON THE GENERATION OF IMMUNE RESPONSES *IN VITRO*. *(E.)* Mishell, R. I. (Dept. Bacteriol. Immunol., U. California, Berkeley), A. H. Lucas, B. B. Mishell and H. S. Koren. *J Reticuloendothel Soc* 15(6):26a, 1974.

4005 MODE OF IMMUNOSUPPRESSIVE ACTION OF EHRLICH ASCITIC FLUID. *(E.)* Hrsak, I. (Ruder Boskovic Inst., Zagreb, Yugoslavia) and T. Marotti. *J Natl Cancer Inst* 53(4):1113-1119, 1974.

4006 THE INTERACTION OF IgE WITH RAT BASOPHILIC LEUKEMIA CELLS. I. EVIDENCE FOR SPECIFIC BINDING OF IgE. *(E.)* Kulczycki, Jr., A. (Natl. Inst. Health, Bethesda, Md.), C. Isersky and H. Metzger. *J Exp Med* 139(3):600-616, 1974.

4007 *IN-VITRO* INTERACTIONS BETWEEN ANTITUMOR ANTIBODIES AND ANTI-ANTIBODIES IN MALIGNANCY. *(E.)* Hartmann, D. (McGill U. Cancer Res. Unit, Montreal, Canada), M. G. Lewis, J. W. Proctor and H. Lyons. *Lancet* 2(7895):1481-1483, 1974.

4008 COMPARISON BETWEEN DIFFERENT TECHNIQUES OF IMMUNO-PROTECTION IN THE A-SW MOUSE/SEWA TUMOUR SYSTEM. *(E.)* Favre, R. (I.N.S.E.R.M., Marseille, France), Y. Carcassonne and G. Meyer. *Br J Cancer* 29(4):300-304, 1974.

4009 INHIBITION OF LEUCOCYTE MIGRATION IN PATIENTS WITH LARGE INTESTINAL CANCER BY EXTRACTS PREPARED FROM LARGE INTESTINAL TUMOURS AND FROM NORMAL COLONIC MUCOSA. *(E.)* McIllmurray, M. B. (City Hosp., Nottingham, England), M. R. Price and M. J. S. Langman. *Br J Cancer* 29(4):305-311, 1974.

4010 FAILURE OF TERMINAL COMPLEMENT COMPONENTS TO INDUCE LYSIS OF MOLONEY VIRUS TRANSFORMED LYMPHOCYTES. *(E.)* Cooper, N. R. (Scripps Clin. Res., Fdn., La Jolla, Calif.), M. J. Polley and M. B. A. Oldstone. *J Immunol* 112(2):866-868, 1974.

4011 *IN VITRO* DETECTION OF IMMUNE RESPONSES TO MTV-INDUCED MAMMARY TUMORS: ACTIVITY OF SPLEEN CELL PREPARATIONS FROM BOTH MTV-FREE AND MTV-INFECTED MICE. *(E.)* Blair, P. B. (Dept. Bacteriol. Immunol., U. California, Berkeley), M. A. Lane and M. J. Yagi. *J Immunol* 112(2):693-705, 1974.

4012 *IN VITRO* IMMUNE STIMULATION-INHIBITION TO SPONTANEOUS CANINE TUMORS OF VARIOUS HISTOLOGIC TYPES. *(E.)* Fidler, I. J. (Sch. Vet. Med., U. Pennsylvania, Philadelphia), R. S. Brodey and S. Bech-Nielsen. *J Immunol* 112(3):1051-1060, 1974.

4013 AUTORADIOGRAPHIC STUDIES ON THE PROLIFERATION OF ANTIBODY-PRODUCING CELLS *IN VITRO*. *(E.)* Hunig, T. (Inst. Virol., Wurzburg, Germany), A. Schimpl and E. Wecker. *J Exp Med* 139(3):754-760, 1974.

4014 THE IMMUNOLOGICAL IDENTIFICATION OF MALIGNANT LYMPHORETICULAR CELLS. *(E.)* Jaffe, E. (Natl. Cancer Inst., Bethesda, Md.), E. Shevach, M. Frank, C. Berard and I. Green. *J Reticuloendothel Soc* 15(6):76a-77a, 1974.

4015 THE MORPHOLOGICAL, BIOLOGICAL, AND ANTIGENIC CHARACTERISTICS OF TRANSPLANTABLE PAPILLOMAS AND KERATINOUS CYSTS INDUCED BY METHYLCHOLANTHRENE. *(E.)* Andrews, E. J. (Coll. Med., Pennsylvania State U., Hershey). *Cancer Res* 34(11):2842-2851, 1974.

4016 DIFFERENTIAL RECOGNITION BY THYMOCYTES OF H-2 AND NON-H-2 ALLOANTIGENS. *(E.)* Peck, A. B. (Dept. Med. Genet., U. Wisconsin, Madison) and F. H. Bach. *Nature* 252(5483):507-508, 1974.

4017 ALTERATIONS OF KARYOTYPE AND ONCOGENICITY IN MOUSE MYELOMA MOPC-315 AND 5-BROMODEOXYURIDINE-RESISTANT CELL LINES. *(E.)* Shepard, J. S. (Dartmouth Med. Sch., Hanover, N.H.), O. S. Pettengill, D. H. Wurster-Hill and G. D. Sorenson. *Cancer Res* 34(11):2852-2858, 1974.

4018 CELLULAR MEDIATED IMMUNITY IN CANCER PATIENTS AND THE EFFECT OF BCG. *(E.)* Samson, M. (Dept. Oncol., Wayne State U., Detroit, Mich.), M. E. Sexon-Porte, M. Al-Sarraf and V. K. Vaitkevicius. *J Reticuloendothel Soc* 15(6):16a, 1974.

4019 EFFECT OF NON-SPECIFIC SENSITIZATION TO BACILLUS CALMETTE-GUERIN (BCG) ON *IN VIVO* AND *IN VITRO* VIRAL LEUKEMOGENESIS. *(E.)* Weinman, R. (Albert Einstein Med. Ctr., Philadelphia, Pa.), K. Vathanophas, E. G. Hampton and H. Friedman. *J Reticuloendothel Soc* 15(6):15a-16a, 1974.

4020 IMMUNOLOGIC PROFILES OF FIRST TRANSPLANT AKR LEUKEMIAS. *(E.)* Barker, A. D. (Biomed. Sci. Sect., Battelle Labs., Columbus, Ohio) and S. D. Waksal. *J Reticuloendothel Soc* 15(6):10a, 1974.

4021 THYMUS AND BONE MARROW DERIVED LYMPHOCYTE INTERACTION IN LEUKEMIA VIRUS-INFECTED MICE. *(E.)* Siegel, M. J. (Pennsylvania State Univ., University Park), W. S. Ceglowski and H. Friedman. *J Reticuloendothel Soc* 15(6):10a-11a, 1974.

4022 NEOPLASTIC CELLS FROM CHILDHOOD LYMPHOBLASTIC LEUKEMIA AND LYMPHOMA WITH T AND B LYMPHOCYTE MARKERS. *(E.)* Kersey, J. (U. Minnesota, Minneapolis), A. Sabad, K. Gajl-Peczalska, H. Hallgren, E. J. Yunis and M. Nesbit. *Am J Pathol* 74(2):64a, 1974.

4023 HELPER ACTIVITY OF THYMIC CELLS IN THE CELLULAR TRANSFER OF IMMUNOGLOBULIN PRODUCTION. *(E.)* Anderson, R. E. (U. New Mexico, Sch. Med., Albuquerque) and N. L. Warner. *Am J Pathol* 74(2):64a-65a, 1974.

4024 COMPARATIVE RADIOSENSITIVITY OF HUMAN LYMPHOCYTES IN AN *IN VITRO* MODEL OF THE TRANSPLANTATION IMMUNE RESPONSE. *(E.)* Nichols, W. S. (U. New Mexico Sch. Med., Albuquerque), G. M. Troup and R. E. Anderson. *Am J Pathol* 74(2):65a, 1974.

4025 ABSENCE OF T ROSETTE-FORMING CELLS IN MICE IMMUNIZED WITH A B-LYMPHOCYTE-INDEPENDENT ANTIGEN. *(E.)* Cruse, J. M. (Immunol. Res. Unit, U. Mississippi, Jackson), G. K. Lewis and H. D. Whitten. *Am J Pathol* 74(2):65a-66a, 1974.

4026 STUDIES ON RNA EXTRACTS FROM LYMPHOID CELLS: I. INCORPORATION OF SPLEEN CELLS. II. CHARACTERIZATION OF ACTIVE FRACTION OF PLASMACYTOMA RNA EFFECTIVE IN INDUCING SURFACE IMMUNOGLOBULINS ON LYMPHOID CELLS. *(E.)* Wang, S. R. (U. Illinois Med. Cent., Urbana). *Diss Abst Int B* 35(6):2577, 1974.

4027 ISOLATION AND CHARACTERIZATION OF MYELOMA VARIANTS DEFECTIVE IN IMMUNOGLOBULIN SECRETION. *(E.)* Waring, G. L. (U. Oregon, Eugene). *Diss Abst Int B* 35(6):2578-B, 1974.

4028 IDIOTYPIC SPECIFICITY OF SURFACE IMMUNOGLOBULIN AND THE MATURATION OF LEUKEMIC BONE-MARROW-DERIVED LYMPHOCYTES. *(E.)* Fu, S. M. (Rockefeller U., New York, N.Y.), R. J. Winchester, T. Feizi, P. D. Walzer and H. G. Kunkel. *Proc Natl Acad Sci USA* 71(11):4487-4490, 1974.

4029 DEVELOPMENT OF SPECIFIC CELL-DEPENDENT ANTIBODY DURING GROWTH OF A SYNGENEIC RAT SARCOMA. *(E.)* Basham, C. (Chester Beatty Res. Inst., Sutton, Surrey, England) and G. A. Currie. *Br J Cancer* 29(3):189-198, 1974.

4030 COMBINED T AND B CELL ACUTE LYMPHOBLASTIC LEUKAEMIA. *(E.)* Haegert, D. G. (Addenbrook's Hosp., Cambridge, England), J. C. Cawley, A. Karpas and A. H. Goldstone. *Br Med J* 4(5936):79-82, 1974.

4031 MUCOSAL GLYCOPROTEINS IN CARCINOMA CELLS OF GASTROINTESTINAL TRACT, AS DETECTED BY IMMUNOFLUORESCENCE TECHNIQUE. *(E.)* Kawasaki, H. (Kurume U. Sch. Med., Japan) and E. Kimoto. *Acta Pathol Jap* 24(4):481-494, 1974.

4032 WHATEVER HAPPENED TO IMMUNESURVEILLANCE? *(E.)* Anonymous. *New Sci* 65(1):4, 1975.

4033 PRESENCE OF J CHAIN IN HUMAN IMMUNOCYTES CONTAINING VARIOUS IMMUNOGLOBULIN CLASSES. *(E.)* Brandtzaeg, P. (Dent. Fac., U. Oslo, Blindern, Norway). *Nature* 252(5482):418-419, 1974.

4034 ANTI-TUMOUR CYTOTOXIC EFFECTS MEDIATED BY MINOR AND MAJOR CELL POPULATIONS OF LYMPH NODES. *(E.)* Seeger, R. C. (Dept. Zool., U. Coll. London, England) and J. J. T. Owen. *Nature* 252(5482):420-421, 1974.

4035 THE USE OF IMMUNOADSORBENT COLUMNS FOR THE ISOLATION OF ANTIBODIES SPECIFIC FOR ANTIGENS ASSOCIATED WITH HUMAN BRONCHOGENIC CARCINOMA. *(E.)* Watson, R. D. (Dept. Microbiol., U. British Columbia, Vancouver, Canada), A. G. Smith and J. G. Levy. *Br J Cancer* 29(3):183-188, 1974.

4036 CELL MEDIATED IMMUNITY IN CHILDHOOD TUMOURS. *(E.)* Kumar, S. (Christie Hosp., Manchester, England). *Br J Cancer* 29(1):96, 1974.

4037 A NEW LOOK AT THE EB VIRUS AND ONCOGENESIS. *(E.)* Sutton, R. N. P. (King's Coll. Hosp. Med. Sch., London, England). *Br J Cancer* 29(1):96, 1974.

4038 DELAYED CUTANEOUS HYPERSENSITIVITY REACTIONS IN PATIENTS WITH KAPOSI'S SARCOMA. *(E.)* Taylor, J. F. (Dept. Orthopaedics, Liverpool, England) and J. L. Ziegler. *Br J Cancer* 30(4):312-318, 1974.

See also:

* (Rev): 3609, 3611, 3613, 3614, 3615, 3616, 3617, 3629, 3636, 3640, 3641, 3642, 3643, 3644, 3645
* (Chem): 3722, 3725, 3765
* (Viral): 3814, 3822, 3843, 3884, 3899, 3914
* (Epid-Biom): 4100

039 SCAR CARCINOMA OF THE LUNG. FACT OR FANTASY?

(E.) Freant, L. J. (George Washngton U. Med. Ctr., Washington, D.C.), W. L. Joseph nd P. C. Adkins. *Ann Thorac Surg* 17(6):531-537, 974.

he clinical and morphological characteristics of eripheral adenocarcinoma or adenosquamous cell carinoma in 75 patients and of scar carcinoma in 19 ndividuals were compared. Location of the lesions, ex distribution, patient age, and tumor size were imilar for both groups. Although the extent of ascular invasion was also similar, lymph node involvement was greater in the group with scar carinoma. Five-yr survival was far less in the scar arcinoma group (5%) than in the adenocarcinoma 22%) or adenosquamous cell carcinoma (28%) groups. he poor prognosis for scar carcinomas may be due o the earlier blockage of lymphatic drainage by he scarring process and the accumulated pooling of arcinogens within the scar for much longer periods, esulting in more extensive vascular and lymphatic eeding than seen in either adenocarcinoma or adenoquamous cell carcinoma. It is suggested that the iagnosis of scar carcinoma is purely histological. t is questioned whether scar carcinoma is a separte clinical entity and suggested that its clinical haracteristics are no different than those of simiar cell types without associated lung scarring.

040 DEVELOPMENT OF REFRACTORY ANEMIAS. RELATIONS WITH MYELOMONOCYTIC LEUKEMIA.

(Fr.) ittoun, R. (Hotel Dieu, Paris, France), M. Certin, . Audebert and J. Bousser. *Ann Med Interne (Paris)* 25(6/7):593-598, 1974.

heoretical considerations and observed data on the ossible transformation of refractory anemia with artial myeloblastosis into myelomonocytic leukemia nd acute leukemia are presented. Four out of 28 ases of refractory anemia with partial myeloblastois, with an average duration of evolution of 15 onths, became transformed into subacute myelomonoytic leukemia; and transformation into acute leuemia was observed in 7 cases, including one case of ransformation following a myelomonocytic leukemic hase. Four cases of acute leukemia were of the yelomonocytic type, and the myelocytic type was oberved in one case. These transformations occurred n 2 to 31 months. Observations and data from the iterature indicate that the evolution of refractory nemia with partial myeloblastosis is often characerized by an increase in monocytosis and concomitant ggravation of medullary insufficiency. The leukemic ransformation is not infrequently progressive and ontinuous, rather than sudden. An intermediary hase with myelemia and monocytosis, often termed as onocytic leukemia or chronic erythromonocytic leuemia, is generally observed. The leukemia ultimatey developing is often of myelomonocytic or erythroonocytic type. A monocytic component is still preent even if the transformation terminates in myeloroliferative syndrome rather than in acute leukemia. ases of chronic myeloid leukemia are characterized y the absence of Philadelphia chromosome and by inreased serum and urinary lysozyme levels. The duration of the preleukemic phase varies from 3 to 78 months according to different authors, while that of the leukemic phase may vary from a few weeks to 21 months. While leukemic transformation affects some third of all patients with refractory anemia, the prognosis is no better for cases that show no leukemic transformation.

4041 FANCONI ANEMIA: ITS TRANSFORMATION INTO LEUKEMIA AND FINDINGS ON ERYTHROCYTE METABOLISM.

(Ger.) Gotz, M. (Pediatr. Clin., Univ. Vienna, Austria), H. Handel, E. Pichler and G. Weippl. *Kinderaerztl Prax* 42(2):69-74, 1974.

Two cases of Fanconi anemia are reported. Fanconi anemia in a 9.5-yr-old boy developed rapidly into acute leukemia. Acute stem cell leukemia, small cystic renal degeneration, internal hemorrhagic pachymeningiopathy and acute anoxic lesions of the cerebral cortex were found on autopsy. Impaired erythropiesis and an erythrocyte iron incorporation peak of over 70% after 5 days were found in another 10.5-yr-old boy with Fanconi anemia. Erythrocyte metabolism studies revealed reduced glutathione stability and increased hexokinase, phosphofructokinase, pyruvate kinase, lactate dehydrogenase, glucose-6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase, and glutathione reductase activities. Increased pyruvate and lactate syntheses were observed, while the ATP and ADP levels were normal. Typical structural chromosomal aberrations (chromatid breaks, fragments, exchanges and abnormal chromosomes) were found in 27 of 50 mitotic figures analyzed; 13 mitoses displayed more than one aberration.

4042 STAGE DEVELOPMENT OF CERVICAL PREINVASIVE CANCER ARISING FROM EROSIONS AND POLYPS.

(Rus.) Smirnov, E. A. (V. N. Rozanov Central Regional Hosp., Moscow, USSR). *Vopr Oncol* 20(8):25-31, 1974.

Histological studies of 1,275 biopsies of erosions and krauroses of the cervix uteri and 954 polyps of the cervical canal and the vaginal cervical area revealed the development of preinvasive cancer in 3.6% and 1.78% resp., of the cases. Invasive cancer developed from the erosions and polyps in 5.8% and 1.67% resp., of the cases; from krauroses, in 18% of the cases. Epidermal erosions and polyps resulted in preinvasive cancer in 4.5% and 2.17% resp., of the cases. It was found that preinvasive cancer of the cervix uteri and the cervical canal has 4 stages: the proliferation of basal cells in the multilayer flat epithelium; the multiplication of cells in the malpighian layer with clearing of the cytoplasm and the nuclei and early signs of hyperchromia of the nuclei; the beginning of cell anaplasia (polymorphism, nuclear hyperchromia, mitoses); solid cellular anaplasia, multiple mitoses, with retention of the basal membrane corresponding to carcinoma *in situ*. It is suggested that an early diagnosis of preinvasive and invasive cancer must involve a timely and adequate biopsy including the underlying connective tissue at the depth of no less than 1 cm.

4043 HORMONAL DISORDERS IN PATIENTS WITH FIBROADENOMATOSIS OF THE BREAST WITH A PAST HISTORY OF OVARY DISEASES.

(Rus.) Turkevich, N. M. (Inst. Oncol. Problems, Kiev, USSR); R. N. Akimova, A. N. Gorevaia, M. P. Ischenko, N. S Kartavova, L. N. Koritskaia, N. M. Makarchuk, P. Ia. Nekrasov and E. M. Samundzhan. *Vopr Onkol* 20(10):57-61, 1974.

Excretion of steroid hormones and gonadotropins and thyroid function were studied in 30 patients with hyperplasia of the breast associated with hormonal disorders and 20 healthy women aged 21-48. The patients were divided into three groups: 14 women with chronic ovaritis (5-15 yr); 8 women with a past history of ovaritis and cystic transformation of the ovaries; and 8 women who had had unilateral oophorectomy for cystic ovaries 2-7 yr prior to the study. The results show that the hormonal disorders in patients with ovary diseases depend on the nature of the pathological process. The patients in group 1 revealed a decrease in the excretion of classical estrogens (29.1 ± 6.5 μg/day in patients; 46.2 ± 6.6 μg/day in healthy women). The total estrogens/pregnandiol ratio showed an impaired excretion of progesterone throughout the menstrual cycle. The patients in this group had a higher level of ^{131}I in the thyroid 24 hr after the injection of the isotope (31.5 ± 1.7% in patients; 25.5 ± 1.1% in healthy women). In the second group, a higher estrogen content was observed, particularly in the second half of the cycle. There was a higher rate of excretion of estradiol and estone during the ovulatory and luteal cycles (13.3 ± 3.6; 9.7 ± 0.6 and 9.5 ± 3.0; 11.4 ± 3.0 resp.). A substantial increase of 17-ketosteroids was observed during the ovulatory cycle (9.6 ± 0.9 μg/day). The thyroid activity did not differ noticeably from that of the healthy women. In group 3, the patients showed a drop in the excretion of estrogens during the 1st and 3d phases of the cycle. Most patients had disorders in the normal rhythm of excretion of steroid hormones and gonadotropins, while some revealed an intensified gonadotropin function of the pituitary. It is suggested that hormonal disorders as a result of ovary diseases are etiopathogenic in the development of fibroadenomatosis of the breast.

4044 ACTIVITY OF β-GLUCURONIDASE IN EPITHELIAL PROLIFERATION OF THE MAMMARY GLANDS, PARTICULARLY IN CARCINOMA.

(Ger.) Knezevic, M. (M. Stojanovic Clin. Hosp., Zagreb, Yugoslavia), S. Knezevic-Krivak and B. Rode. *Verh Dtsch Ges Pathol* 57:409, 1973.

Histochemical studies of β-glucuronidase activity in epithelial proliferation of the mammary glands revealed an exceptionally high activity of this enzyme in the tumor epithelium in all forms of mammary gland carcinoma, but even higher activities were found in fibrocystic mastopathy. Stromal macrophages also had a high β-glucuronidase activity. Very high β-glucuronidase activity was present in the neoplastic glandular epithelium as well as in glandular acini and milk ducts, which indicates this enzyme plays a specific role in breast disease, perhaps by hydrolyzing mucopolysaccharides in the ground substance. Increased adenosine triphosphatase activity was found in proliferating cells in fibrocystic mastopathy and in cancerous epithelial cells, particularly in epithelial cell membranes. High contents of alkaline phosphatase and of enzymes which split ATP and ADP were present in connective tissue around proliferating glandular epithelium and tumor epithelium.

4045 CONTRALATERAL METASTASIS OF BREAST CANCER INTO THE AXILLARY LYMPH NODES.

(Rus.) Bazhenova, A. P. (P. A. Gertsen Sci. Res. Inst. Oncol., Moscow, USSR) and L. D. Ostrovtsev. *Vopr Onkol* 20(7):78-82, 1974.

Contralateral metastases of breast cancer into the axillary nodes were detected in 84 patients (5.2% of patients treated in a 10 yr period); 13 (15.4%) had primary tumors with metastases into axillary lymph nodes on both sides; 27 (32.2%) had isolated metastases into the contralateral axillary lymph nodes; 31 (37.0%) had metastases into other lymph nodes and viscera; and 13 (15.4%) developed contralateral metastases after the metastatic spreading into other lymph nodes and the viscera. Metastases of this type are considered to be an unfavorable prognostic sign. Combined therapy should include preoperative radiation, mastectomy, ovariectomy with subsequent hormone and chemotherapy. The survival of the patients with contralateral axillary metastases ranged from three months to four yr.

4046 CHROMOSOME ANOMALIES AND PATHOLOGICAL MITOSES IN FIBROADENOMATOSIS AND CANCER OF THE BREAST.

(Rus.) Neishtadt, E. L. (N. N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR). *Vopr Onkol* 20(7):3-8, 1974.

Comparative studies of chromosome and mitotic anomalies were conducted on mastectomized specimens from 50 patients with proliferating fibroadenomatosis, 50 with fibroadenomatosis undergoing malignant transformation and 50 with breast cancer. The chromosome analyses of 81 cells from 4 patients with malignant breast fibroadenomatosis and 69 cells from 5 patients with breast cancer showed that aneuploidy reached 74.1% and 81.3%, resp. The analysis of 33 metaphases from 4 patients with proliferating fibroadenomatosis revealed only two hyperploid and one pseudodiploid cell (9.1% of the total). Malfunctioning of the mitotic system may be the cause of cellular aneuploidy in malignant tumors and hyperplastic processes. A correlation was observed between the number of anomalous meta- and anaphases and the level of aneuploidy. Thus, pathological mitoses constituted 8.4% of all mitoses in proliferating fibroadenomatosis, 62.7% in malignant fibroadenomatosis and 39.1% in breast cancer. Aneuploidy in the cells of proliferating fibroadenomatosis is evidence of its precancerous nature.

4047 MULTICENTRIC AND BILATERAL APPEARANCE OF LOBULAR CARCINOMA *IN SITU* OF THE BREAST: A RETROSPECTIVE STUDY OF ALL BREAST TISSUE SPECIMENS REMOVED FROM 52 FEMALES WITH LOBULAR CARCINOMA *IN SITU*.

(E.) Andersen, J. A. (Sundby Hosp., Copenhagen, Denmark). *Acta Pathol Microbiol Scand [A]* 82(6):730-734, 1974.

A series of breast tissue specimens removed from women with lobular carcinoma *in situ* of the breast were studied retrospectively for the appearance of multicentric and bilaterial lobular carcinoma *in situ*. Sixty-four specimens were obtained from 52 patients during a follow-up period averaging 17 yr; slides were prepared from tissue blocks for histologic study. Examination revealed the lobular carcinoma *in situ* to be bilateral in 8 of 25 cases and multicentric in 9 of 19 cases. This assessment of the multicentric and bilaterial appearance of lobular carcinoma *in situ* differs from previous studies in that the specimens had been removed and examined primarily without regard to the presence of lobular carcinoma *in situ*; thus, the figures do not reveal the actual appearance of the disease, but the "spontaneous" appearance found retrospectively.

4048 HISTOLOGY OF NEUROBLASTOMAS.

(E.) Sandstedt, B. (Karolinska Hosp., Stockholm, Sweden). *Maandschr Kindergeneesk* 42(9-10):386-388, 1974.

A review of the histology of neuroblastomas emphasizes the relationship between developing stages of the sympathetic nervous system and different types of sympathetic nerve tumors. Changes in developing ganglia have counterparts in the differentiation of neuroblastomas; they both show varying degrees of maturity. Survival rate is related to tumor maturity, and most investigations show better prognosis for more differentiated or mature tumors. A rigid classification of the sympathetic tumors is considered impossible, since there are no sharp dividing lines between the groups, and they have to be classified on the basis of the preponderent cell type present.

4049 CHROMOSOMAL ANALYSIS OF METASTATIC RETINOBLASTOMA CELLS.

(E.) Inoue, S. (Child Res. Cent. Michigan, Detroit), Y. Ravindranath, M. J. Ottenbreit, R. I. Thompson and W. W. Zuelzer. *Humangenetik* 25(2):111-118, 1974.

Ophthalmoscopic examination of a 2 1/2-year-old boy showed an extensive yellowish vitreous exudate which was diagnosed as exudative retinitis. Six months later, having developed anemia, thrombocytopenia, and right-sided proptosis, he was diagnosed as having acute myelogenous leukemia. The patient was given vincristine, 6-mercaptopurine, and prednisone, and the skull and spine were irradiated. Bone marrow aspirated one month later appeared normal, but clumps of tumor cells were found in the spinal fluid. Intrathecal injections of methotrexate cytosine arabinoside were ineffective in reducing the cell count in the spinal fluid and the patient died two months later. Neoplastic cells identified as retinoblastoma were found in the right eye, meninges, and bone marrow at autopsy. Pre- and post-chemotherapy bone marrow specimens, a post-irradiated spinal fluid specimen, and cultured blood cells from the patient were examined cytogenetically along with blood and skin fibroblasts from the parents and a fraternal twin brother. The majority of the prechemotherapy and spinal fluid cells were hyperdiploid, containing 48 or 47 chromosomes. At least six marker chromosomes were identified, one of which closely resembled the m_2 marker of retinoblastoma cells previously described by Mark. The post-chemotherapy bone marrow revealed no hyperdiploidy or markers. The karyotypes of the blood cells were also normal, as were the skin and blood fibroblasts of the parents and brother. It is concluded that the malignant cells in the patient's bone marrow and spinal fluid were derived from the same clone. Cytogenetic examination of more cases is needed to determine whether there is a common marker peculiar to retinoblastoma.

4050 NATURAL HISTORY OF MALIGNANT STEM CELLS.

(E.) Pierce, G. B. (Univ. Colorado Med. Cent., Denver), P. K. Nakane and J. E. Mazurkiewicz. *Proc Int Symp Princess Takamastsu Cancer Res Fund, 4th*, pp. 453-467, 1973.

Data from a series of experiments are reviewed to support the concept that the target in carcinogenesis is either a stem cell or its incompletely differentiated progeny. Malignant stem cells (embryonal carcinoma) of teratocarcinomas were identified by cloning and shown to be multipotential and capable of differentiating into tissue representing each of the primary embryonic germinal layers. The differentiated progeny of embryonal carcinoma were benign. In addition, differentiation of stem cells of malignant tumors of breast, skin, and cartilage was observed and led to the conclusion that carcinogenesis was equivalent to differentiation; it had, as its target, normal stem cells that were converted by alteration of genomic controls to malignant stem cells. Depending on the capacity for differentiation, the tumor appeared undifferentiated or differentiated. All stem cells have in common an abundance of organelles associated with the synthesis of cytoplasmic structure at the expense of organelles associated with the production of luxury molecules. The ultrastructural attributes of stem cells vary depending on the tissue of origin and the propensity for growth at the expense of differentiation. Studies should be undertaken to direct the differentiation of malignant stem cells to the benign state.

4051 MORPHOGENETIC FEATURES OF EARLY GASTRIC CANCER.

(Rus.) Nesvetov, A. M. (Cent. Inst. Postgrad. Med., Moscow, USSR), E. A. Rokhlin and M. I. Shusterov. *Arkh Patol* 36(9):24-31, 1974.

Histogenetic studies were performed on 38 patients with early gastric cancer. Four groups of early tumors were identified: (1) tumors developing from a chronic peptic ulcer or postulcerous scar (25 cases); (2) tumors developing from gastric polyps (nine cases); (3) superficial infiltrative tumors, (two cases), and (4) dysontogenetic cancer (two cases). Since the overwhelming majority of gastric carcinomas develop against a background of peptic ulcer and hyperplastic polyps, these conditions are considered precancerous. In all cases, gastric precancer involved transformation of the gastric mucosa accompanied by atrophy, intestinal metaplasia and focalized glandular hyperplasia.

4052 PROGRESSION OF POLYCYTHAEMIA VERA TO MALIGNANT MYELOFIBROSIS AND RETICULUM CELL SARCOMA. *(E.)* McVie, J. G. (Dept. Therapeutics, Edinburgh U., Scotland), A. C. MacMichael and D. M. Ramsay. *Scand J Haematol* 13(1):61-63, 1974.

In May 1968, a 61-yr-old man was diagnosed as having polycythaemia vera, as revealed by high white cell and platelet counts, an increased leukocyte alkaline phosphatase score, and an elevated red cell mass. The patient was treated with a total of 17 mCi of ^{32}P over a period of 17 months. In November, 1970 an episode of cholestatic jaundice occurred following chlorpromazine administration and a prolonged course of cycloserine treatment was required for a urinary tract infection in conjunction with prostatic hypertrophy. In December 1971, the patient had no symptoms except intermittent claudication; hemoglobin (Hb), white cell, and platelet counts were normal. A month later he became depressed and his Hb dropped. By the following month the platelet and white cell counts were low and marked symptomatic deterioration had occurred. A diagnosis of myelofibrosis was made. The ESR was raised and rouleaux formation was seen in the peripheral blood film. A therapeutic trial of ethambutol and isoniazid had no effect. Death was preceded by severe thrombocytopenic purpura which was unaffected by transfusions of blood and platelets. Autopsy findings of concentrated foci of abnormal reticulum cells in the marrow and other organs suggested a diagnosis of reticulum cell sarcoma. No primary tumor was evident. The reticulum cell sarcoma may have been an extension or a poorly differentiated form of malignant myelofibrosis.

4053 HISTOGENESIS OF ANGIOMATOUS AREAS IN MENINGIOMAS. AN ELECTRON MICROSCOPE STUDY. *(E.)* Ermel, A. E. (Dep. Neuropathol., Gen. Pathol. Anat., Univ. Louvain, Belgium). *Pathol Eur* 9(3): 217-231, 1974.

A histological survey of 6 meningiomas was made using electron microscopy of the richly vascularized areas of three endotheliomatous meningiomas and of three angiomatous meningiomas. The cells of the islets of angiomatous meningiomas are closely crowded, with elongated cytoplasm, frequently involved in winding processes. There are three main cell types, one with pale cytoplasm due to paucity of organelles, and two dark cells, one filled with agglutinated cytofilaments, and the other with abundant free ribosomes. Other tumor cells have fibroblastic characteristics. The endothelial cells of the capillary walls are of the same three types found in the islets, but are joined by tight junctions. The second type of dark cell sometimes forms the endothelial lining of the vessel, sometimes the outermost layer of the islet. The blood vessels are surrounded by multiple layers of basement membranes with cellular debris in the interstices between the layers. In places the endothelium was pluristratified, and in a few places the tumor cells were linked directly to the pluristratified endothelium without interposed basement membrane. These findings suggest that the formation of the vascular structures in meningiomas is due to global angiogenic remodeling of the whorl.

4054 DEVELOPMENT OF TWO PRIMARY MELANOMAS IN THE SAME PATIENT AT A 16 YEAR INTERVAL. *(Ger.)* Lischka, G. (Fac. Clin. Med., Univ. Heidelberg, Germany) and A. Hildinger. *Z Haut Geschlechtskr* 49(4):129-135, 1974.

A primary malignant melanoma was removed from the chest of a 35-yr-old man. Two axillary lymph node metastases were removed later in the same year, and a lipoma was removed from the arm 5 yr later. A second primary malignant tumor, a circumscribed precancerous melanosis of Dubreuilh, was diagnosed and removed 16 yr after the malignant melanoma. Histological findings (involvement of the epidermis, junctional activity and peritumoral inflammatory infiltrate) revealed that the second melanoma was a primary tumor rather than a late metastasis of the first one. The increased incidence of primary melanomas in former melanoma patients, as compared with the general population, has been reported in the literature.

4055 EPIDERMOLYSIS BULLOSA DYSTROPHICA WITH EPIDERMAL NEOPLASMS. *(E.)* Reed, W. B. (U. California, Irvine), J. College, Jr., M. J. O. Francis, H. Zachariae, F. Mohs, M. A. Sher and I. B. Sneddon. *Arch Dermatol* 110(6):894-902, 1974.

4056 SUPERFICIAL MELANOMA IN A TATOO. *(E.)* Wolfort, F. C. (Cambridge Hosp., England), J. E. Hoopes, H. S. Filtzer and T. C. Cochran. *Br J Plast Surg* 27(4):303-304, 1974.

4057 MALIGNANT MELANOMA IN CHILDHOOD. *(E.)* Olbourne, N. A. (Wexham Park Hosp., Slough, England) and S. H. Harrison. *Br J Plast Surg* 27(4):305-307, 1974.

4058 THE ULTRASTRUCTURE OF NEUROBLASTOMA GLIOMA SOMATIC CELL HYBRIDS. EXPRESSION OF NEURONAL CHARACTERISTICS STIMULATED BY DIBUTYRYL ADENOSINE 3',5' CYCLIC MONOPHOSPHATE. *(E.)* Daniels, M. P. (Lab. Biochem. Genet., Natl. Inst. Health, Bethesda, Md.) and B. Hamprecht. *J Cell Biol* 63 (2):691-699, 1974.

4059 THREE CASES OF GARDNER'S SYNDROME. *(E.)* Teramoto, T. (Keio U., Sch. Med., Tokyo, Japan), M. Motegi, N. Murayama, S. Baba and O. Abe. *Jap J Clin Oncol* 6(4):69-76, 1974.

4060 ULTRASTRUCTURAL AND CYTOCHEMICAL CHANGES OF PROXIMAL TUBULE CELLS IN THE EXPERIMENTAL RENAL CELL CARCINOGENESIS. *(E.)* Sugihara, R. (Nara Med. U., Japan) and N. Ito. *J Electron Microsc (Tokyo)* 23(3):207, 1974.

4061 MICROSPECTROPHOTOMETRIC STUDIES ON NUCLEAR DNA ACTIVITY IN ENDOMETRIUM: WITH PARTICULAR REFERENCE TO GENESIS OF ENDOMETRIAL CARCINOMA. *(E.)* Kubo, S. (Jikei U. Sch. Med., Japan). *Jikei Med J* 21(1):25-46, 1974.

4062 ABNORMAL CELLS IN THE PERIPHERAL BLOOD OF PATIENTS WITH HODGKIN'S DISEASE. II. ULTRASTRUCTURAL STUDIES. *(E.)* Halie, M. R. (Dept. Med., U. Groningen, Netherlands), M. Splett-Romascano, I. Molenaar and H. O. Nieweg. *Br J Haematol* 28(5):323-328, 1974.

4063 ABNORMAL CELLS IN THE PERIPHERAL BLOOD OF PATIENTS WITH HODGKIN'S DISEASE. I. OBSERVATIONS WITH LIGHT MICROSCOPY. *(E.)* Halie, M. R. (Dept. Med., U. Graningen, Netherlands), W. Huiges and H. O. Nieweg. *Br. J. Haematol* 28(5):317-322, 1974.

4064 CELL POPULATION KINETICS OF TRANSPLANTED AND METASTATIC LEWIS LUNG CARCINOMA. *(E.)* Simpson-Herren, L. (Southern Res. Inst., Birminghan, Ala.), A. H. Sanford and J. P. Holmquist. *Cell Tissue Kinet* 7(4):349-361, 1974.

4065 THE RELATIONSHIP OF TESTICULAR TUMOURS TO MALDESCENT. *(E.)* Spita, D. L. (Transvaal Mem. Hosp. Children, Johannesburg, South Africa). *S Afr Med Tydskr* 48(2):45-46, 1974.

4066 MEGAKARYOCYTE POLYPLOIDY IN ACUTE LEUKEMIA AND PRELEUKEMIA. *(Ger.)* Queisser, W. (Mannheim Fac. Clin. Med., U. Heidelberg, Germany), U. Queisser, M. Ansmann, G. Brunner, H. Heimpel and D. Hoelzer. *Verhandl Dtsch Ges Inn Med* 79:416-418, 1973.

4067 AMELOBLASTOMA OF MUCOSAL ORIGIN. A PATHOBIOLOGIC REEVALUATION. *(E.)* Richardson, J. F. (Boston U. Sch. Grad. Dent., Mass.) and R. O Greer. *Arch Otolaryngol* 100 (3):174-175, 1974.

4068 VILLOUS ADENOMA OF THE COLON AND RECTUM: AN ULTRASTRUCTURAL STUDY. *(E.)* Ioachim, N. J. (St. Vincent's Hosp., New York, N.Y.), W. E. Delaney and A. Madrazo. *Cancer* 34(3):536-596, 1974.

4069 MORPHOLOGICAL TYPING OF ENDOMETRIAL ADENOCARCINOMA AS THE BASIS OF THE NATURAL HISTORY OF THE TUMOR. *(It.)* Filotico, M. (Vito Fazzi Reg. Gen. Hosp., Lecce, Italy), M. Trabucco, F. Faggiano, G. Mannarini and S. Grasso. *Tumori* 60 (2):163-170, 1974.

4070 ORAL PAPILLOMAS. CLINICOPATHOLOGIC EVALUATION AND RETROSPECTIVE EXAMINATION FOR DYSKERATOSIS IN 110 LESIONS. *(E.)* Greer, R. O. (Boston Univ. Sch. Grad. Dent., Mass.) and H. M. Goldman. *Oral Surg Med Pathol* 38(3):435-440, 1974.

4071 CLINICAL OBSERVATIONS ON PRELEUKEMIA. *(Ger.)* Wildhack, R. (Rissen Gen. Hosp., Hamburg, Germany). *Verhandl Dtsch Ges Inn Med* 79: 413-414, 1973.

4072 EARLY AND PRELEUKEMIC STAGES OF ACUTE LEUKEMIA. *(Ger.)* Heimpel, H. (Ctr. Inn. Med. Pediatr., U. Ulm, Germany). *Verhandl Dtsch Ges Inn Med* 79:283-289, 1973.

4073 AN INVESTIGATION OF THE ASSOCIATION BETWEEN BULLOUS PEMPHIGOID AND MALIGNANT DISEASE. *(Ger.)* Ebner, H. (Dept. Dermatol., U. Vienna) and E. Spangler. *Wien Klin Wochenschr* 86 (16):449-452, 1974.

4074 EVALUATION OF SOME CYTOCHEMICAL AND BIOCHEMICAL HEMATOLOGICAL PARAMETERS IN VARIOUS STAGES OF CHILDHOOD LEUKEMIA. *(Ukr.)* Bebeshko, V. H. (Kiev Sci. Res. Inst. Hematol. Blood Transfusion, USSR), Ye. P. Vinnits'ka, S. S. Kyreyeva, H. I. Anistratenko and I. K. Ustiushina. *Pediatr Akush Ginekol* 36(1):18-20, 1974.

4075 MULTIPLE SEBACEOUS ADENOMAS AND GASTROINTESTINAL CARCINOMA. *(E.)* Sciallia, G. F. (Mayo Clin. Fdn., Rochester, Minn.) and R. K. Winkelmann. *Arch Dermatol* 110(6):913-916, 1974.

See also:

* (Rev): 3618, 3636, 3646, 3647, 3648
* (Chem): 3666, 3681
* (Immun): 3931, 3971

4076 AN EPIDEMIOLOGIC AND SEROLOGIC COMPARISON OF UTERINE CARCINOMA *IN SITU* AND SQUAMOUS DYSPLASIA. *(E.)* Thomas, D. B. (Johns Hopkins Univ., Sch. Hyg. Public Health, Baltimore, Md.) and R. I. Anderson. *Am J Epidemiol* 100(2):113-123, 1974.

A case control study was conducted for groups of white women from Washington County, Maryland, aged 15 to 50, one group having cervical carcinoma *in situ* and the other having squamous dysplasia, matched with a probability sample (age and race matched) of controls having normal cytologic smears. Serology tests were made for presence of antibodies and each patient was interviewed for detailed epidemiologic information. A simultaneous evaluation of 12 variables by multiple linear regression found trichomonads to be the only factor by which both women with carcinoma *in situ* and women with squamous dysplasia differed from controls. The cases with carcinoma *in situ* (as opposed to controls) were characterized by marital instability (defined as divorced, separated, or a widow remarried), and conception of first child before marriage. The cases with squamous dysplasia were characterized by a history of vaginal discharge, a low level of formal education, and the presence of complement-fixing antibodies against cytomegalovirus, adenovirus, herpesvirus simplex, and *Mycoplasma pneumoniae*. The relative risk of dysplasia increased with the number of positive tests for trichomonads and antibodies. These findings suggest that carcinoma *in situ* is most likely caused by one or more venerally transmitted carcinogens, and that most dysplasia represents a nonspecific reaction of the cervical epithelium to inflammatory agents. Specific agents that might cause dysplasia were indicated by serologic tests and include *Trichomonas vaginalis*, cytomegalovirus, and herpesvirus simplex. Dysplasia is probably not an earlier stage of the same pathologic process as carcinoma *in situ*; however, lesions classified as dysplasia that are early stages of the same pathologic process as carcinoma *in situ*, if any, cannot be distinguished by their severity.

4077 EPIDEMIOLOGICAL OBSERVATIONS OF HUMAN LEUKEMIA IN A METROPOLITAN AREA. *(E.)* Chin, T. D. Y. (US Dep. Health Educ. Welfare, Kansas City, Kan.), P. M. Silberfarb and R. E. Lynch. *Bibl Haematol* (39):1136-1141, 1973.

Cases of human leukemia in the Kansas City metropolitan area between 1966-1969 were identified in order to obtain epidemiological information. During this four-yr period, 414 cases of leukemia were reported, representing an average rate of 8.3 cases/100,000 population/yr; the rate for each yr remained uniform. Of the cases, 245 (59%) were diagnosed as acute leukemia; among these over half were classified as myelogenous. Of 169 cases (31%) of chronic leukemia, 76% were lymphocytic. While the median age for acute lymphocytic leukemia was 14 yr, that for other clinical types was above 60 yr of age. The incidence of chronic lymphocytic leukemia, as well as of acute and chronic myelogenous leukemia, rises with age. For acute lymphocytic leukemia, the age distribution assumes a U-shaped curve. An increase in incidence of leukemia in colder months of the yr was found and may be related to the greater prevalence of respiratory infections preceding leukemia onset. Cluster data analysis is in progress to investigate the indication that leukemia cases were infrequently associated with congenital defects, unusual irradiation, drug administration, or contact with leukemic pets.

4078 EPIDEMIOLOGICAL INVESTIGATIONS ON CANCER IN WORKERS EXPOSED TO ALDOL AND OTHER ALIPHATIC ALDEHYDES. *(Ger.)* Bittersohl, G. (Cent. Occup. Hyg. Chem. Ind., Leuna, Germany). *Arch Geschwulstforsch* 43(1):172-176, 1974.

The incidence of cancer among workers exposed to aldol and other aliphatic aldehydes in the air of an acetaldehyde factory was studied. Acetaldehyde, butyraldehyde, crotonaldehyde, *n*-butanol, aldol and higher alcohols were detected in the air. Nine cases of cancer occurred from 1967 through 1972 among 150 workers who had been exposed for more than 20 yr; this corresponds to a significantly increased incidence of 6,000/100,000. Two cases of squamous carcinoma of the oral cavity, one case of gastric adenocarcinoma, 1 case of cecal adenocarcinoma, and five cases of squamous carcinoma of the bronchi were diagnosed. Eight of the cancer patients had smoked 5-10 cigarettes/day, and another had smoked more than 30 cigarettes/day. In the latter patient, carcinoma of the oral cavity developed at an age of 58 yr after a 13 yr latent period. Four patients were aged 55 to 59 yr, and another four were over 65 yr old. The latency period in these eight patients was 26 ± 4 yr. The findings indicate that aldol may be a carcinogen, while other aliphatic aldehydes, which are also present in automobile exhaust gases and cigarette smoke, may be cocarcinogens.

4079 AN EPIDEMIOLOGIC STUDY OF MORTALITY WITHIN A COHORT OF RUBBER WORKERS, 1964-72. *(E.)* McMichael, A. J. (Sch. Pub. Health, U. North Carolina, Chapel Hill), R. Spirtas and L. L. Kupper. *Occup Med* 16(7):458-464, 1974.

Between 1964 and 1972, an epidemiological mortality study was carried out on 6678 male rubber workers employed at a major tire-manufacturing plant in Ohio. Data on 1783 deaths within this group was obtained. Comparison with 1968 U.S. national mortality data yielded a Standardized Mortality Ratio (SMR) for all causes of death of 99 for the full cohort, and of 93 for the sub-cohort aged 40-64 (the active employment age-range). The SMR was significantly elevated for malignant neoplasms of the stomach, prostate, and the blood-and-lymph-forming tissues (including leukemia), but was below expected for cancers of the bladder, lung, central nervous system, and pancreas. The SMR was significantly elevated for ischemic heart disease in the age-range 40-49 and for diabetes mellitus. Analysis of proportional mortality rates among equivalent populations at five other plants within the same company indicated a pattern of cancer mortality generally similar to that found for the study population; however, the rates for malignant neoplasms of the lung, bladder, and central nervous system showed proportional excess. Until the mortality exper-ence of different groups of rubber workers in dif-erent production areas are compared, it cannot be ssumed that the observed cause-specific mortality xcesses are attributable to work-environment ex-osure within the rubber industry.

080 LIVER DAMAGE AND ANGIOSARCOMA IN VINYL CHLORIDE WORKERS: A SYSTEMATIC DETECTION ROGRAM. *(E.)* Makk, L. (St. Anthony Hosp., Louis-ille, Ky.), J. L. Creech, J. G. Whelan, Jr. and M. . Johnson. *JAMA* 230(1):64-68, 1974.

ecently, five cases of angiosarcoma of the liver were iscovered in Louisville, Kentucky; all of the patients ad worked in a plant producing polyvinyl chloride PVC). Since none of the patients had any specific bnormal findings on physical examination or routine aboratory tests, a program was designed whereby large umbers of workers could be screened for liver disease ith relative ease. Significant abnormalities were valuated by a combined program of clinical, compre-ensive laboratory, and roentgenographic study. If bnormalities suggestive of serious liver disease or ossible angiosarcoma were found, the patient was ospitalized and hepatic panangiography performed. If he angiograms suggested the possibility of tumor, pen-liver biopsy was advised with consideration of epatic lobectomy, if so indicated at exploration. creening profiles were obtained from 1183 employees f the plant; comprehensive evaluations were perform-d on 75 workers with liver-related abnormalities. wo new cases of hepatic angiosarcoma and three cases f portal fibrosis were found on further evaluation. f the liver function tests, the γ-glutamic transpeptidase determination seemed to be the most useful in detecting abnormalities and reflecting the extent of liver lesions; alkaline phosphatase, serum glutamic-oxalacetic transaminase, serum glutamic-pyruvic transaminase, lactic acid dehydrogenase, and bilirubin tests were also useful. No test was specific for angiosarcoma. Liver scans and angiographic studies correlated well with the results of laboratory tests and biopsy examinations in the detection of cirrhosis, and hepatic panangiography was helpful in differentiating neoplastic from nonneoplastic lesions.

4081 ROLE OF THE CASE-CONTROL DESIGN IN THE STUDY OF HODGKIN'S DISEASE. *(E.)* Mack, T. (Harvard Sch. Public Health, Boston, Mass.). *Cancer Res* 34(5):1166-1169, 1974.

A discussion is given of the usefulness of case-control studies as a tool for comprehending the epidemiology of Hodgkin's disease. Such a study should be a relatively inexpensive and rapid method to investigate this rare disease in a large population. Attention must be paid to comparability, elimination of bias, and testing simultaneously or successively of multiple complex hypotheses. Weakness of case-control studies often involves poor use of statistical material or misinterpretation of assocation or causal relationships. Suggestions for improving case-control studies on Hodgkin's disease include: use of multiple control groups (such as in hospital as well as neighborhood controls); time-space cluster analyses, because the exact time of onset of this disease is indistinct; and multi-institutional cooperative etiological studies in order to cover large populations.

4082 DISCUSSION OF CASE-CONTROL STUDY OF HODGKIN'S DISEASE. *(E.)* Newell, G. R. (Dep. Epidemiol., Biostat., Tulane Med. Cent., New Orleans, La.) and B. E. Henderson. *Cancer Res* 34(5):1169-1171, 1974.

A collaborative case-control study was undertaken to investigate the etiology of Hodgkin's disease. Possible risk factors, such as tonsillectomy and previous infectious mononucleosis were considered. An assessment was made of serological differences between cases and controls with respect to Epstein-Barr virus (EBV) and other herpesviruses, as well as of their HL-A type frequencies. Although two previous studies found a higher risk factor for Hodgkin's disease among patients with tonsillectomies, this study did not find a statistical significance between patients and matched controls, siblings, or spouses. No relationship was demonstrated between infectious mononucleosis and subsequent development of the cancer in adult males; this confirmed other negative results. One significant finding was that Hodgkin's disease patients had a six-fold increase in prior history of Dexedrine (amphetamine) use when compared to unrelated controls; this held true for both sexes and for younger and older adults. Antibody titers to EBV in this group of Hodgkin's disease patients were significantly elevated, with a GMT (geometric mean antibody titer) of 92.0, as compared to a matched clinic GMT of 52.6, a spouse GMT of 53.5, and a sibling GMT of 32.2. It was concluded that EBV is not important in the etiology of lymphocyte predominant or other histologic forms of Hodgkin's disease. Additionally, patients with the disease are suspected of having an altered ability to control the proliferation of other herpes-viruses besides EBV. While an association between human HL-A loci and genes controlling immune response and viral susceptibility may exist, more information is needed to define factors of host susceptibility to Hodgkin's disease.

4083 GASTRIC CANCER IN AMERICAN NEGROES. *(E.)* Kovi, J. (Howard Univ. Coll. Med., Washington, D.C.), M. V. Viola, C. A. Connoly and R. Vohra. *Cancer* 34(3):765-770, 1974.

Results of a retrospective study of 150 American blacks with gastric carcinoma seen at Howard University Hospital between 1960 and 1972 are compared with those of a series composed of Caucasian American patients. Age and sex distribution, histologic appearance of the carcinoma, and operability rate for the two racial groups were similar. However, among the Howard University group, 12 patients had co-existant peptic ulcer and 9 had x-ray confirmation of past peptic ulcer. A higher incidence of associated duodenal ulcer (1.33%) was found in the black sample, as compared with a Mayo Clinic study (incidence of 0.37%). Whereas in a previous study of

250 patients, unselected by race, 6.8% had pernicious anemia when stomach cancer was diagnosed, no black patients in this group had a history of that disease. The ABO blood groups distribution for gastric cancer patients of this sample showed an excess of group B and a deficiency of group 0 as compared with control ($p < 0.01$). This contrasts with previous reports of an excess of blood group A among stomach cancer patients. The survival of black patients at each of four stages of the disease was poorer than for comparable Caucasian patients. It is believed that social, economic, and dietary factors influence host resistance to this disease and account for the higher risk of stomach carcinoma among American blacks.

4084 METABOLIC EPIDEMIOLOGY OF COLORECTAL CANCER. *(E.)* Wynder, E. L. (Am. Health Found., New York, N.Y.) and B. S. Reddy. *Cancer* 34(3):801-806, 1974.

On the basis of the geographical distribution of colon cancer and data dealing with migrant populations, it is proposed that the etiology of this cancer is related to dietary factors, particularly animal fats and proteins. Diet, intestinal components of endogenous origin, and intestinal microflora are compared. The unanswered question is what diet-dependent compounds, modified by intestinal microflora in the lumen of the gut, account for development of cancers of the colon. Quantitative aspects of bile acids and natural sterols in the feces of various groups who ate different foods were investigated. The microbial β-glucuronidase activity in the feces was studied to assess degree of microbial capacity for enzymic hydrolysis of complex conjugates in the large bowel. Also, the ability of pure strains of intestinal microflora to metabolize bile acids and neutral sterols in various products was determined. Data indicated that daily fecal excretion of cholesterol metabolites coprostanol and coprostanone was significantly higher ($p < 0.01$) in Americans on a mixed Western diet than any other group; a significant increase in the excretion of total bile acids deoxycholic acid, and lithocholic acid was found in this group. Data on β-glucuronidase indicate a higher activity in the microflora of persons on this type of high animal protein and fat diet. This finding suggests the possibility of establishing a specific indicator in order to identify individuals at high-risk for large bowel cancer.

4085 A PROSPECTIVE SERO-EPIDEMIOLOGICAL STUDY TO INVESTIGATE THE ROLE OF EBV IN BURKITT'S LYMPHOMA. *(E.)* De-The, G. (Int. Agency Res. Cancer, Lyon, France) and A. Geser. *Bibl Haematol* (39):448-456, 1973.

A sero-epidemiological study to be conducted on 1500 children (aged 2-5 yr) in the West Nile District of Uganda will investigate the extent to which Epstein-Barr virus (EBV) is an essential factor for the development of Burkitt's lymphoma (BL). The serological pattern of the children who subsequently develop BL will be compared with that of the corresponding general population to test the following hypotheses: (1) there is no causal relationship between EBV and the development of BL; (2) EBV infection is a necessary factor for the development of BL, but infection could be either primary (2a) or could represent a reinfection (2b); (3) BL develops in children who have had long and heavy exposure to EBV; (4) a causal relationship exists between EBV and BL but involves special sequential events between infection by EBV and influence of cofactors leading to a long and variable latent period. An attempt will be made to determine whether the children who eventually develop BL have experienced a heavier or different malaria burden than that of children who do not develop BL. Children in the malaria study will be re-bled regularly for the duration of the survey, as will children in a substudy concerned with the prevalence, age, and sex-specific incidence of EBV infection in a population at high risk for BL. An analysis of the results and a decision is expected three yr after the start of the study.

4086 CHILDHOOD CANCER IN SOUTHERN IRAN. *(E.)* Haghighi, P. (Pahlavi Univ. Sch. Med., Shiraz, Iran), E. A. Mohallatee, K. Nasr, F. Dezhbakhsh, S. Salmasi and K. Daneshbod. *Cancer* 34(5):1842-1848, 1974.

A study was made of all diagnosed cancer cases from the Fars Province over a 9-yr period in an attempt to delineate the general epidemiology of childhood cancer in Southern Iran. Age- and sex-specific annual cancer incidence rates/100,000 population of the province were calculated for selected sites then compared with the corresponding rates from Sweden. There were 328 childhood cancers (from newborn through 14 yr) in the 9-yr period, representing 6.2% of all cancers diagnosed and an annual incidence rate of 5.2 cancers/100,000 children. The 5 commonest childhood cancers in the region were: leukemias, nodal lymphomas, and bone, soft part, and ocular neoplasms. The cancer incidence rates for all sites were considerably lower than the corresponding Swedish rates, which could be the result of either an actual lower cancer rate or underdiagnosis in the region.

4087 ROLE OF ETHNIC BACKGROUND IN CANCER DEVELOPMENT. *(E.)* Modan, B. (Chaim Sheba Med. Cent., Tel Aviv, Israel). *Isr J Med Sci* 10(9):1112-1116, 1974.

Graphic variations in the incidence of malignant disorders were compared in European-, Asian- and North African-born groups in Israel and white and black groups in the USA. Newly diagnosed cases in selected cancer sites in Israel during a 5-yr period were analyzed and compared with findings from a 10-city study conducted in the US. The relative incidence rates among European-born groups living in Israel compared with Asian- and African-born groups there showed a striking parallelism to the patterns seen in white and black groups in the US. Since those ethnic subgroups do not have a common genetic background, the similarities observed may be associated with a socioeconomic gradient. This corroborates previous observations of cancers attributed to environmental factors, but the hypothesis does not apply to all cancer categories, and it is possible that a genetically determined characteristic such as glucose-6-phosphate dehydrogenase deficiency or some biochemical component may play a role in determining risk differences.

4088 THE PATTERN OF INCIDENT AGE DISTRIBUTION WITH CLINICAL STAGING FOR CANCER OF THE CERVIX IN ENGLAND AND WALES FROM 1945 TO 1969. *(E.)* Mould, R. F. (Westminster Hosp., London, England). *J Obstet Gynaecol Br Commonw* 81(8):644-649, 1974.

The incident age distribution for three stages of carcinoma of the cervix in various geographical areas was investigated. Data were obtained from a survey of Registrar General Reports for the general population of 12 regions in England and Wales; this represents the largest body of cervical cancer age and stage correlated data for these countries. Trends were examined by comparing region, clinical stage of the disease, and five-yr periods between 1945 and 1969. Calculations of mean age points for each given stage (I, II, and III) of cancer of the cervix show that most are tightly clustered. The least industrialized and least populous areas had the highest mean ages, particularly for Stage II and Stage III cancers. This phenomenon was attributed to a lower cancer education with a resultant patient delay in seeking medical advice. The mean age for Stage I carcinoma of the cervix decreased slightly from 1950 to 1959. It is suggested that this was due to a marked decrease in the proportion of 55 to 64 yr-olds, perhaps because of social patterns following the second World War. Factors which might have influenced age distribution patterns in the data include: an increase of cytological screening; variations in natural tumor growth rate; and availability and accuracy of this large data base.

4089 MALIGNANT NEOPLASMS IN THE GERMAN DEMOCRATIC REPUBLIC. TABLES ON INCIDENCE AND MORTALITY. *(Ger.)* Berndt, H. (Cent. Inst. Cancer Res., Berlin-Buch, Germany). *Arch Geswulstforsch* 44(2):151-166, 1974.

Epidemiological data are presented on the incidence and mortality for new cases of malignant neoplasms in East Germany in 1969. Nearly 58,000 new cases of malignant neoplasms were reported in 1969, corresponding to an incidence of 339.1/100,000, or 343.3 in males, and 335.5 in females. The age group under 20 yrs accounted for 1% of all cases. The incidence was very low under age 35 yrs and increased rapidly from 35-40 yr onward, with the age bracket over 65 yrs accounting for two-thirds of all cases. The incidence of gastric cancer and of cancer of the bronchi and lungs were highest, accounting for 12.9% and 12.8%, resp. of all cancer. In the male population, lung cancer and gastric cancer were most common (24.4% and 15.7%, resp), while cancers of the breast and cervix were the most common in females (15.3% and 12.9%, resp.). Malignant neoplasms of the gastrointestinal and respiratory tracts and of the urogenital organs accounted for over two-thirds of all new cases in males, and malignant neoplasms of the gastrointestinal and urogenital organs, and of the breast accounted for almost three-fourths of all new cases in females. Malignant neoplasms of the lymphatic and hemopoietic tissues, and tumors of the eye, brain, and nervous system accounted for about 90% of all cases in the 5-10 yr age group, while neoplasms of the bones and testes were significantly increased in the 10-20 yr age group. The mortality from cancers of all locations amounted to 262.4/100,000 in males, and 222/100,000 in females, averaging 240.6. The mortality ranged from about 50% to two-thirds in the lower age groups relative to the new cases and increased considerably among those over 65 yr old. The mortality to incidence ratio was more favorable in females than in males (66% to 75%). The mortality from cancers of different locations decreased to the same extent as the incidence of such neoplasms. Considerable geographical differences were found in the overall mortality and in the incidence of malignant neoplasms of different locations. Some of these differences may be due to environmental factors.

4090 FUNDAMENTAL REMARKS ON THE PROBLEM OF OCCUPATIONAL CAUSED LEUKEMIAS. *(Ger.)* Stobbe, H. (Dept. Med., Humboldt U., Berlin, Germany) and R. Stieglitz. *Arch Geschwulstforsch* 44(1):11-15, 1974.

4091 HODGKIN'S DISEASE IN CONNECTICUT FROM 1935 TO 1962. THE BIMODAL INCIDENCE CURVE IN THE GENERAL POPULATION AND SURVIVAL IN UNTREATED PATIENTS. *(E.)* Greco, R. S. (Yale U. Sch. Med., New Haven, Conn.), R. M. Acheson and F. M. Foote. *Arch Intern Med* 134(6):1039-1043, 1974.

4092 CANCER IN TUSCANY. *(E.)* Knight, R. A. (No affiliation) and N. A. Mitchison. *Nature* 252(5483):530, 1974.

4093 GYNAECOLOGICAL ABNORMALITIES FOUND AT A CYTOLOGY CLINIC. *(E.)* Edwards, D. (Isle of Wight Area Health Authority, England). *Br Med J* 4(5938):218-221, 1974.

4094 HODGKIN'S DISEASE MORTALITY AND OCCUPATIONAL EXPOSURE TO WOOD. *(E.)* Petersen, G. R. (Sch. Pub. Hlth., Commun. Med., U. Washington, Seattle) and S. Milham, Jr. *J Natl Cancer Inst* 53(4):957-958, 1974.

4095 CANCER OF THE NASAL FOSSA IN WOOD-WORKERS. *(Fr.)* Leroux-Robert, M. J. (No affiliation). *Bull Acad Natl Med (Paris)* 158(1):53-61, 1974.

4096 GENETIC IMPLICATIONS OF FAMILIAL BRAIN TUMORS. *(E.)* Isamat, F. (Sagrado Corazon Hosp., Barcelona, Spain), A. M. Miranda, F. Bartumeus and J. Prat. *J Neurosurg* 41(5):573-575, 1974.

4097 CANCER MORTALITY AMONG CHINESE AMERICANS. *(E.)* Fraumeni, Jr., J. F. (Natl. Inst. Health, Bethesda, Md.) and T. J. Mason. *Proc Am Assoc Cancer Res* 15(March):22, 1974.

4098 PATTERNS OF GROWTH AND METASTATIC SPREAD OF HUMAN MALIGNANT TUMORS (EPITHELIOMAS, SARCOMAS AND MELANOMAS) TRANSPLANTED IN "NUDE" THYMUSLESS MICE. *(E.)* Stehlin, J. S. (St. Joseph Hosp., Houston, Tex), B. C. Giovanella, S. S. Lee and L. J. Williams. *Proc Am Assoc Cancer Res* 15(March): 24, 1974.

4099 GROWTH CHARACTERISTICS OF HUMAN MELANOMA XENOGRAFTS IN THE HAMSTER CHEEK POUCH. *(E.)* Richmond, R. E. (U. California Sch. Med., Los Angeles). *Proc Am Assoc Cancer Res* 15(March):138, 1974.

4100 MULTIPLE PRIMARY CANCER, HL-A, AND CEA IN FAMILY "N". *(E.)* Lynch, H. T. (Creighton U. Sch. Med., Omaha, Neb.), P. I. Terasaki, R. J. Thomas and H. Guirgis. *Proc Am Assoc Cancer Res* 15 (March):186, 1974.

4101 GROWTH KINETICS IN MULTIPLE MYELOMA. *(E.)* Drewinko, B. (M. D. Anderson Hosp., Houston, Tex.) and R. Alexanian. *Proc Am Assoc Cancer Res* 15(March):194, 1974.

4102 FAMILIAL POLYPOSIS AS AN OBLIGATORY CANCER PRESURSOR. *(Ger.)* Schier, J. (Surg. U. Clin., Mainz, Germany). *Langenbecks Arch Chir* 337:771-775, 1974.

See also:

* (Rev): 3612, 3620, 3623, 3634, 3635, 3636, 3646, 3649, 3650
* (Viral): 3813, 3826, 3828, 3829, 3833

103 CHROMATIN-ASSOCIATED DNA ENDONUCLEASE ACTIVITIES IN HeLa CELLS. *(E.)* Urbanczyk, . (Jefferson Med. Coll., Thomas Jefferson U., Philaelphia, Pa.) and G. P. Studzinski. *Biochem Biophys es Commun* 59(2):616-622, 1974.

solated HeLa nuclei were treated with buffer conaining 0.14 M NaCl to remove nucleoplasmic DNase ctivities. A 1.0 M NaCl extract of the residue ontained DNase activity. When this material was pplied to DEAE-cellulose, four peaks of DNase acivity were obtained, two minor (*a* and *c*) and two ajor (*b* and *d*). DNA polymerase activity could not e detected in any of the fractions, and fractions and *d* were free of RNase activity; RNase activity as found in fractions *b* and *c*. All fractions had ow DNA exonuclease activity and were most easily etected by the DNA-activation assay, which measures NA endonuclease activity. The ratio of endo- to xonuclease activity varied from 4.1-21.2 for these hromatin-associated DNases, whereas nucleoplasmic Nases of HeLa cells have ratios in the range 0.21-.50. The fractions differed in thermostability and n their sensitivity to inhibition by yeast transfer NA, cyclic AMP, and reagents which attach -SH groups. he results suggest that the nucleus of the HeLa cell ay contain a variety of enzymes which can break the hosphodiester bonds within the DNA double helix.

104 STUDIES ON GLYCOLYTIC ENZYMES IN RELATION TO CANCER. PART IV: SERA AND EFFUSION CTIVITIES OF PHOSPHOHEXOSE ISOMERASE, ALDOLASE, AND ACTIC DEHYDROGENASE IN MALIGNANT AND BENIGN CONDITIONS. *(E.)* Damle, S. R. (Tata Mem. Hosp., Bombay, ndia) and R. V. Talavdekar. *Indian J Cancer* 11(3): 280-284, 1974.

evels of phosphohexose isomerase (PHI), aldolase (ALD), and lactic dehydrogenase (LHD) were determined in sera and effusions from 36 patients with malignant neoplasms, 23 with cirrhosis of the liver, and 21 with pulmonary tuberculosis. LDH values in pleural and peritoneal effusion of cancer patients were markedly higher than those in sera from the same patients. In benign disease, fluid LDH activity was only slightly higher than that of serum. Both fluid and serum values were within normal range in benign conditions with the exception of active pulmonary tuberculosis where effusion activity was moderately elevated in 50% of the patients. Serum and fluid levels of PHI and ALD were distinctly elevated in malignant disease and were normal in benign disease. Estimations of these three enzymes appear to be necessary in the differential diagnosis of malignant and benign effusions.

4105 CLEAVAGE OF REPLICATING FORMS OF MITOCHONDRIAL DNA BY *Eco*RI ENDONUCLEASE. *(E.)* Robberson, D. L. (Stanford Univ. Sch. Med., Calif.), D. A. Clayton and J. F. Morrow. *Proc Natl Acad Sci USA* 71(11):4447-4451, 1974.

Digestion of mouse L cell mitochondrial DNA with *Eco*RI restriction endonuclease produced two linear duplex fragments comprising 86.3 ± 2.0% and 14.2 ± 1.0% of the circular genome length (16,000 ± 470 nucleotide pairs). Digestion of human HeLa cell mitochondrial DNA with *Eco*RI produced three linear duplex fragments comprising 49.2 ± 1.0%, 44.4 ± 0.9%, and 6.4 ± 0.4% of the circular genome length (16,590 ± 710 nucleotide pairs). These fragments were shown to be generated by cleavage in unique regions of the mouse and human mitochondrial DNAs. Electron microscopic analysis of partially replicated molecules cleaved by *Eco*RI established a unidirectional mode of DNA replication for L cell mitochondrial DNA. The origin for DNA replication is located on the larger *Eco*RI fragments at a position 1890 ± 250 nucleotide pairs (11.8 ± 1.2% of the circular genome length) from the proximal restriction site. Replication proceeds unidirectionally away from this restriction site throughout the length of the large *Eco*RI fragment. Analysis of L cell, D-loop mitochondrial DNA cleaved by *Eco*RI indicated synthesis of a unique sequence in formation of the D-loop in these nonreplicating molecules. The origin of D-loop synthesis is located on the larger *Eco*RI fragment at a position 1760 ± 180 nucleotide pairs (11.0 ± 1.1% of the circular genome length) from the proximal restriction site and is thus the origin for unidirectional displacement replication.

4106 THE POSSIBLE ROLE OF MAST CELLS IN PIGMENTED NEVI. *(E.)* Szekeres, L. (Med. Univ. Szeged, Hungary). *Arch Dermol Forsch* 251(1):55-60, 1974.

Biopsy specimens obtained from 15 female patients with compound type pigmented nevi were examined electron microscopically for the presence of mast cells. High numbers of mast cells were observed closely attached to vascular smooth muscle and the neural elements of nevus-tissue. The mast cells were in close contact with the neural elements and did not show any signs of basal membrane interference. Mast cells were also observed closely attached to axon-cylinders in the midst of nevus cells and Schwann-cell processes. The close attachment of the mast cells to vascular and neural tissues is suggested to be an indication of the mast cells possible role in the transport of materials from the circulation to the nervous system, or from nervous tissue to the circulation.

4107 ACTIVITY OF GLYCOLYTIC ENZYMES IN EHRLICH'S CARCINOMA CELLS DURING DIFFERENT STAGES IN THE MITOTIC CYCLE. *(Rus.)* Kavetskii, R. E. (Inst. Probl. Oncol., Acad. Sci. Ukr. SSR, USSR) and S. D. Kazmin. *Dokl Akad Nauk SSSR* 218(5):1233-1235, 1974.

There are two steps involved in increased glycolysis observed in Ehrlich's carcinoma cells during the mitotic cycle: the first is observed at the beginning of the cycle and reaches a maximum in the S phase, while the second occurs after a short stabilization and reaches a maximum during the G_2 phase. Data were obtained on the activity of glycolytic enzymes in Ehrlich's carcinoma cells at different stages of the cell cycle. The animals were injected five times with hydroxyurea (0.5 g/kg) at two-hr intervals, sacrificed at different times, and the tumor cells were separated into fractions. On the basis of the data obtained, it is suggested that glycolytic enzymes may be classified into two groups: enzymes such as hexokinase and lactic dehydrogenase, with step-wise reduplication (step enzymes); their activity doubles at the beginning of the cycle and then remains stable until mitosis. The remaining four, whose activities reach a peak and then decrease, may be classified as peak enzymes. In contrast to findings in other cell systems, these results suggest that no single enzyme limits the rate of glycolysis in Ehrlich's carcinoma cells. Instead, glycolysis appears to be controlled by hexokinase at the beginning of the cell cycle and by phosphofructokinase starting with the end of the S phase. The other enzymes do not appear to have much effect on the rate of glycolysis.

4108 PROPERTIES OF THE GENOME IN EXPERIMENTAL HEPATOMAS: VARIATIONS IN THE COMPOSITION OF CHROMATIN. *(E.)* Stein, G. S. (Univ. Florida, J. Hillis Miller Health Cent., Gainesville), W. E. Criss and H. P. Morris. *Life Sci* 14(1):95-105, 1974.

The chromosomal proteins of two rapidly growing and poorly differentiated Morris hepatomas were compared with those of liver from normal and tumor-bearing Buffalo rats. Chromatin from the tumor and liver nuclei was fractionated electrophoretically on SDS polyacrylamide gels. The DNA content and the relative amounts of histone and nonhistone chromosomal proteins associated with the chromatin were then determined. While the total quantity of DNA-associated histones was similar in all tumor and liver chromatin preparations studied, the tumor chromatin contained an increased quantity of nonhistone chromosomal proteins. In addition, the tumors possessing nonhistone chromosomal protein bands were absent from the liver chromatin of the normal and tumor bearing animals; these additional bands were seen in the 28,000-40,000 and 130,000-180,000 molecular weight regions of the gels. Variations in the specific classes of histones and nonhistone chromosomal proteins associated with the genomes of the two tumors, host liver, and liver of the tumor bearing animals were also observed. The results suggest that the chromosomal proteins of the Morris hepatomas differed quantitatively and qualitatively from those of normal rat liver.

4109 CHROMOSOMAL NONHISTONE PROTEINS OF RAT HEPATOMAS AND NORMAL RAT LIVER. *(E.)* Chae, C. B. (Dep. Biochem., Univ. North Carolina, Chapel Hill), M. C. Smith and H. P. Morris. *Biochem Biophys Res Commun* 60(4):1468-1474, 1974.

The electrophoretic patterns of the chromosomal nonhistone proteins (CNHP) of well-differentiated Morris rat hepatomas, fetal liver, regenerating liver, and normal liver were compared to determine whether the patterns of the hepatomas CNHP resemble those of fetal and regenerating liver. Chromatin isolated from the various tissues was dissociated and the CNHP separated by SDS gel electrophoresis in the presence of Tris-glycine buffer. The protein and DNA contents of the tissues were also determined. Chromatin prepared from the Morris hepatomas contained two to three times more CNHP than the normal and host liver chromatin. The amount of CHNP in regenerating liver at the S-phase was also two times higher than in normal liver chromatin, while the CNHP of fetal liver (20 days gestation) was lower than that of normal or host liver chromatin. There were also several differences in the electrophoretic patterns of the CNHP of the hepatomas and normal liver, but not between the regenerating or fetal liver and the normal liver. The data suggest no similarity between the hepatomas and fetal and regenerating liver in terms of gene expression or DNA replication.

4110 FURTHER INVESTIGATION OF A VARIANT OF THE PLACENTAL ALKALINE PHOSPHATASE IN HUMAN HEPATIC CARCINOMA. *(E.)* Higashino, K. (Osaka Univ. Sch. Med., Japan), S. Kudo and Y. Yamamura. *Cancer Res* 34(12):3347-3351, 1974.

Tissues obtained from three patients with hepatic carcinoma were studied for the occurrence of an abnormal alkaline phosphatase previously reported to be associated with hepatic carcinoma. Following partial purification of the variant isoenzyme of alkaline phosphatase, the enzyme was assayed for activity, subjected to electrophoretic separation and studied immunologically in comparison with placental alkaline phosphatase (D-variant phenotype). The abnormal alkaline phosphatase obtained from the sera and hepatic carcinoma tissues was similar to placental alkaline phosphatase with respect to activity inhibition by amino acids, urea and ethylenediaminetetraacetate. Differences between the enzymes were seen with respect to pH optimum, heat stability, electrophoretic mobility, and activity inhibition by phosphate. The enzymes have similar molecular weights, and exhibit partial common immunochemical reactivity. The variant isoenzymes obtained from sera and tissue of hepatoma patients were not different immunochemically. The variant isoenzyme was found to be localized in hepatoma tissue and blood. It is suggested that the isoenzyme is produced by hepatic cancer tissue and released into the blood stream along with normal liver alkaline phosphatase produced by healthy parts of the liver.

4111 LACTIC DEHYDROGENASE ISOENZYMES IN THE OVARIES OF MICE WITH DIFFERENT PREDISPOSITIONS TO MAMMARY TUMORS. *(Rus.)* Zaretskaia, I. A. (P. A. Gertsen Inst. Oncol., Moscow, USSR), V. I. Boikova, I. P. Tereschenko and O. I. Kizlenko. *Biull Eksp Biol Med* 78(12):59-61, 1974.

Ovarian glycolysis was studied in 12 C3H and 14 C57Bl female mice injected s.c. weekly with diethylstilbestrol diproprionate (DES; 200 mg in 0.1 ml physiological saline) for one month; 16 mice of each line served as controls. C3H mice have a high incidence of spontaneous mammary tumors, while C57Bl mice are resistant to these tumors, even when they are given

S for long periods. Electrophoresis and histolog-
al studies of diformazan granule deposition demon-
rated that the most rapidly moving isoenzyme, LDH_1,
s the most active and that liver- and muscle-type
H occurred primarily in the anode fractions in the
aries of both lines of untreated mice. In untreat-
controls, the activities of anode fraction (LDH_1
d LDH_2) were lower in C3H mice than in C57Bl, while
e activities of cathode fractions (LDH_4 and LDH_5)
re lower in C57Bl than in C3H mice. DES increased
e activities of the anode fractions and decreased
e activities of the cathode fractions in tumor-
one C3H mice but had no significant effect on LDH
oenzymes in tumor-resistant C57Bl mice. DES also
used an increase in the synthesis of liver-type
H in the tumor-prone line, apparently because of
or hormone regulation.

12 REASSOCIATION KINETICS OF DNA FROM THE THYMUS AND RAT ASCITES HEPATOMA. *(Rus.)*

anson, K. P. (Roentgenol. Radiol. Inst., Leningrad,
SSR) and B. D. Zhivotovskii. *Biull Eksp Biol Med*
7(11):92-94, 1974.

e structure of the genome of thymus cells and rat
scites hepatoma was studied by the method of DNA
eassociation kinetics. Zajdela ascites hepatoma
as injected i.p. into random-bred albino male rats,
ollowed by ^{3}H-thymidine (total dose, 500 µCi per
nimal). Reassociation curves showed that rat DNA
as heterogenous and contained fast (10-18%), inter-
ediate (20-25%), and slow (55-60%) fractions.
o difference in the reassociation curves of
NA from tumor or normal tissues was observed in
ny of the three zones. It is suggested that re-
ssociation kinetics fails to distinguish between
NA in normal and neoplastic cells.

13 RNA POLYMERASE ACTIVITY IN HUMAN BRAIN TUMORS. *(E.)*

Slagel, D. E. (Univ.
entucky Coll. Med., Lexington). *Acta Neuropathol* 30
4):355-359, 1974.

e activity of RNA polymerase in nuclei of human
rain tumors, and alpha amanitin, cycloheximide and
ifampicin inhibition of RNA polymerase activity were
tudied and compared to normal human brain and sheep
rain activities. RNA polymerase activity was meas-
red through ^{3}H-guanosine triphosphate incorporation,
nd was similar in control brain and biopsy specimens
f six brain tumors. Cycloheximide (500 µg/ml) had
o effect on RNA polymerase activity in any of the
amples studied. Alpha amanitin (0.02 µg/ml) in-
ibited 90% of the RNA polymerase activity in three
f the tumors, and 60-70% in the other three. Addi-
ion of rifampicin (250 µg/ml) along with alpha aman-
in resulted in an additional 10% inhibition of RNA
olymerase activity in the tumors inhibited 60-70%
y alpha amanitin. These tumors were reported to be
he less malignant astrocytomas. The author suggests
hat additional studies on isolated RNA polymerases
btained from animal brain tumors are required for
clearer interpretation of these results.

4114 SUBRIBOSOMAL PARTICLES OF HeLa CELLS. *(E.)*

Smulson, M. (Sch. Med., Georgetown Univ., Washington, D.C.). *Exp Cell Res* 87(2):253-258, 1974.

Ultrastructural studies of postribosomal cytosol derived from lysis of HeLa particles revealed the presence of well-defined ring-shaped and rectangular particles. Morphologically the particles resembled particles recently isolated from plasma cell tumors and independently from culture medium of malignant cells. Although the highest concentration of particles was localized at 14-17S, the particles were heterogenously distributed throughout the 10-30S range of sucrose gradients. Electron micrographs of particles sedimenting at 25-30S showed considerable aggregation; at high magnification the rectangular particles could be visualized as a stack composed of 3-4 ring-shaped particles or, alternatively, a ring-shaped particle to which 'end-pieces' are attached. The particles possessed elongation factor 2 activity, which was previously found together with aminoacyl-tRNA synthetase activity in extracellular particles of identical morphology. The possible relationship of the particles to protein synthesis is discussed.

4115 FRACTIONATION OF RNA FROM LIVER, HEPATOMA, AND GASTRIC MUCOSA BY PREPARATIVE POLYACRYLAMIDE GEL ELECTROPHORESIS. *(Rus.)*

Kalinovskii, V. P. (N. N. Petrov Inst. Oncol., Leningrad, USSR), T. A. Goriukhina and I. F. Seits. *Vopr Med Khim* 20 (5):540-544, 1974.

Analytical polyacrylamide-gel electrophoretic studies were made of the main fractions of cytoplasmic RNA from the livers of normal rats and rabbits, rats with Zajdela ascites hepatoma and the gastric mucosa of rabbits. By using this method, it was possible to analyze both the major and 17-19 minor fractions of cytoplasmic RNA without any deleterious effects on their molecular structures. All of these RNA fractions were then obtained by preparative electrophoresis, using a column containing 2.5% polyacrylamide gel. The fractions of 28S, 18S and 4S of cytoplasmic RNA from rat liver and hepatoma cells were almost identical. In the rabbit, the main fractions of cytoplasmic RNA from the gastric mucosa were similar to those from the liver.

4116 TERMINAL DEOXYNUCLEOTIDYLTRANSFERASE IN CHRONIC MYELOGENOUS LEUKEMIA. *(E.)*

Sarin, P. S. (Natl. Cancer Inst., Bethesda, Md.) and R. C. Gallo. *J Biol Chem* 249(24):8051-8053, 1974.

The detection and partial characterization of a terminal deoxynucleotidyltransferase activity in WBC from a patient with chronic myelogenous leukemia in blast crisis is reported. WBC were collected by leukophoresis from a 36-yr old man who had chronic myelogenous leukemia. About 80% of the cells were myeloblasts as seen in a peripheral blood smear. The terminal transferase activity was eluted from a phosphocellulose column and chromatographed on a DEAE Sephadex column. The purified terminal transferase gave a single peak of activity on sedimentation analysis on a 10-60% glycerol gradient. The sedimentation value of the purified enzyme as estimated by velocity gradient centrifugation with ovalbumin as a marker was 3.4S. The pH optimum of the partially purified terminal transferase was 7.5, the Mn^{++} optimum 0.1 mM, and the Mg^{2+} optimum 5-7 mM. The purified enzyme efficiently utilized a number of DNA primers but not RNA primers. The presence of this enzyme in human myelogenous leukemic cells suggests that its presence may be associated with a particular stage of the disease rather than being specific for a particular form of leukemia or for thymic cells.

4117 INFLUENCE OF OXYTOCIN ON PITUITARY-ADRENAL-GONAD RELATIONSHIP AND ON THE DEVELOPMENT OF MAMMARY TUMOURS IN C$_3$H MICE. *(E.)* Pai, S. R. (Cancer Res. Inst., Tata Mem. Cent., Bombay, India). *Indian J Med Res* 61(12):1810-1817, 1973.

The short- and long-term effects of syntocinon, a synthetic preparation of oxytocin, were studied in male and female C$_3$H (susceptible to spontaneous mammary cancer) and C$_{17}$ (resistant to breast cancer) mice. At a dose level of 20 IU (s.c.), syntocinon produced no morphological changes in the gonads or adrenals of normal or adrenalectomized mice of either strain. A reduction in thymic weight was seen in the intact C$_3$H mice immediately after syntocinon treatment, while those of the C$_3$H mice remained unaffected. The kidney weights were relatively reduced in the intact C$_3$H males and relatively elevated in the C$_{17}$ females. Syntocinon had no long-term (two months) effects on the weight or histological appearance of the organs of intact or adrenalectomized male or female C$_3$H mice. Among these animals, there were no mammary tumors in the adrenalectomized animals, while mammary tumors appeared earlier than usual in the intact animals. The results are largely inconclusive, but do indicate that oxytocin probably interferes with growth hormone production in the anterior pituitary.

4118 CELLULAR TUMORIGENICITY IN *NUDE* MICE: CORRELATION WITH CELL GROWTH IN SEMI-SOLID MEDIUM. *(E.)* Freedman, V. H. (Albert Einstein Coll. Med., Bronx, N.Y.) and S. Shin. *Cell* 3(4):355-359, 1974.

Cultured cells derived from either normal or malignant tissues of several mammalian species were injected subcutaneously into the immune-deficient nude mouse in order to determine the cellular properties which are associated with tumorigenicity *in vivo*. The cells were tissues from humans, Lettré mouse, Chinese hamster, Syrian hamster, and rabbit. All established cell lines produced tumors in nude mice with the exception of the mouse 3T3 cell lines. None of the primary diploid fibroblasts from embryonic or adult tissues were tumorigenic. Cellular tumorigenicity is not determined solely by the malignancy of the tissue of origin, since cells derived from nonmalignant tissues become tumorigenic when they are no longer anchorage dependent for growth. In addition, acquisition of infinite growth potential in heteroploid cell lines is not in itself sufficient to confer tumorigenic capacity on the cells. Tumorigenicity can be induced by nontumorigenic cells, whether diploid or heteroploid, by transformation with an oncogenic virus such as SV40. This is consistent with other studies. These results suggest that the degree of cell growth in methyl cellulose is a useful parameter *in vitro* for predicting tumorigenicity in the animal, and also demonstrate the potential usefulness of the *nude* mouse for analysis of cellular malignancy irrespective of the tissue or species of origin.

4119 STIMULATION OF DIVISION OF SPARSE AND CONFLUENT 3T3 CELL POPULATIONS BY A FIBROBLAST GROWTH FACTOR, DEXAMETHASONE, AND INSULIN. *(E.)* Gospodarowicz, D. (Salk Inst. Biol. Studies, San Diego, Calif.) and J. S. Moran. *Proc Natl Acad Sci USA* 71(11):4584-4588, 1974.

The stimulation of division of BALB/c 3T3 mouse fibroblasts by fibroblast growth factor (FGF) alone and in combination with insulin and dexamethasone was investigated. FGF (25 ng/ml) stimulated DNA synthesis in sparse, quiescent cultures maintained in a low serum concentration (0.6%), but did not support more than two growth cycles. In the presence of dexamethasone (1 μg/ml), FGF supported continuous division cycles. Final cell density was 2.2 X 10^5 cells with FGF alone and 5.2 X 10^5 with FGF plus dexamethasone. Cell density was only slightly higher when insulin (1 μg/ml) was added to cells growing in FGF plus dexamethasone. When insulin was added with FGF alone, however, the final cell density was 1.6 times higher than that reached when only FGF was added. FGF stimulated the division of confluent, quiescent cultures grown in 10% serum. Addition of FGF and dexamethasone to such cultures overcame their "contact-inhibition", suggesting that cessation of growth was a result of depletion of growth factors in the medium, rather than cell-cell contact. Neither insulin nor dexamethasone alone or in combination significantly stimulated cell division in sparse cultures maintained in low serum. This suggests that they have an indirect (permissive) effect on DNA synthesis and cell division.

4120 ULTRASTRUCTURAL CHANGES IN THE NUCLEAR ENVELOPE DURING MITOSIS OF CHINESE HAMSTER CELLS: A PROPOSED MECHANISM OF NUCLEAR ENVELOPE REFORMATION. *(E.)* Chai, L. S. (Roswell Park Mem. Inst., Buffalo, N.Y.), H. Weinfeld and A. A. Sandberg. *J Natl Cancer Inst* 53(4):1033-1048, 1974.

Direct fixation with chrome-osmium of mitotic Chinese Don hamster cells revealed three elements not made visible by double fixation with glutaraldehyde followed by osmium tetroxide: highly electron-dense material, granules, and microfibers. The highly electron-dense material was probably of nucleolar origin. The granular materials surrounded the entire romatin mass in late prophase after the nuclear en- lope (NE) had disappeared. In metaphase and early aphase, the granules were distributed uniformly ong the periphery of the chromosomes; they disap- ared in late anaphase and telophase. Microfibers peared in prophase, in the region that had been cupied by NE, attained maximum increase during ana- ase, and started to decrease at the beginning of lophase with the formation of new NE. The micro- bers were organized in bundles and were frequently t connected to granules. Small vesicles were seen ong the perichromosomal granules in prophase and rly metaphase; they disappeared during late meta- ase and early anaphase but reappeared in late ana- ase and telophase in the region where new NE was out to form. Mitochondria, vesicles, new NE, and romatin were spatially associated in that order ring late anaphase and early telophase. Mitochon- ria may play an active role in formation of the esicles which then coalesce to form the new NE.

21 GENERAL PATTERNS OF CHANGE IN THE CONTENT OF FREE RADICALS DURING MALIGNANT GROWTH.

us.) Emanuel', I. M. (Inst. Chem. Phys., Moscow, SR). *Dokl Akad Nauk SSSR* 217(1): 245-248, 1974.

antitative relations between the kinetics of tumor owth and changes in the free radical content were udied in La leukemia, solid and ascites sarcoma 37, lker carcinosarcoma, B-16 melanoma, solid sarcoma 0, Ehrlich ascites carcinoma, and Harding-Passey lanoma. The number of doublings after which these mors reached their fastest growth rate ($n_{W\ max}$) nged from 5.0 to 6.9 (mean 5.6 ± 0.29) for all of e tumors studied. Their free radical contents were termined by electron paramagnetic resonance meas- rements on lympholized tumor samples and by meas- ring incorporation of labelled acrylamide into cell otein, lipid, and melanoprotein. The number of ublings after which the tumor reached its highest ee radical content ($n_{R\ max}$) ranged from 3.5 to 5.7 ean 4.3 ± 0.32). Thus, the maximum free radical ntent is reached, on the average, 1.3 doublings fore the tumor attains its fastest growth rate at 3/4 the number of doublings required for it attain its fastest growth rate. Therefore, the netic curve of changes in the free radical content aches a maximum near the region where the tumor as reached its fatest growth rate and below the rresponding level for normal tissue.

122 REGULATION OF ADENOSINE 3':5'-MONOPHOSPHATE CONTENT IN HUMAN ASTROCYTOMA CELLS BY ADEN- SINE AND THE ADENINE NUCLEOTIDES.

(E.) Clark, R. B. Dep. Biochem., Univ. Massachusetts, Worcester), R. ross, Y. Su and J. P. Perkins. *J Biol Chem* 249(16): 296-5303, 1974.

he effect of adenosine and the adenine nucleotides MP, ADP, and ATP on the concentration of cyclic MP (cAMP) in cultured human astrocytoma cells was studied. The cellular content of cAMP increased rapidly and reached maximum levels by 10 min in response to the addition of adenosine (100 μM), AMP, or norepinephrine to incubated 1321N1 cell cultures. The specific activities of the intracellular and extracellular cAMP decreased during the course of the incubation from about 700 to 350 and 800 to 600 disintegrations/min/pmole, resp. The responsiveness of the cells to the stimulatory effects of the adenosine, catecholamines, and prostaglandins declined with the increasing age of the culture after each passage. ATP and ADP were less effective than the adenosine or AMP but they did cause significant accumulations of cAMP. The nucleotides acted directly and did not need to be converted to adenosine. Adenine, guanosine, deoxyadenosine, and GPT, each at 100 μM, caused no increase in cAMP content. The rate of accumulation of ^{3}H-cAMP in the presence of 100 μM concentrations of adenosine and AMP was $t_{1/2}$ = 1 min. Dipyridamole (10 μM), added to cultures of 1321N1 cells 15 sec prior to the addition of 30 μM ^{3}H-adenosine, markedly inhibited the uptake of ^{3}H-adenosine and its conversion to trichloroacetic acid-soluble radioactivity or ^{3}H-ATP-ADP. It did not inhibit the effect of adenosine, and the accumulation of cAMP was somewhat greater in its presence. The competitive inhibitory action of theophylline (3-1000 μM) on the effect of 100 μM adenosine in both 1181N1 and 1321N1 cell cultures was shown. Papaverine alone had little effect on cAMP but markedly potentiated the effect of adenosine and norepinephrine. Adenosine, ATP, and norepinephrine (100 μM) had no observable effect on phosphodiesterase activity. The results suggest that adenosine and the adenine nucleotides act at extracellular receptor sites, which causes the activation of adenylate cyclase.

4123 3',5'-ADENOSINE MONOPHOSPHATE DURING THE CYCLE IN HeLa CELLS.

(Fr.) Borgna, J. L. (Natl. Coll. Chem., Montpellier, France) and M. Mousseron-Canet. *C. R. Acad Sci* [*D*] (Paris) 279(17): 1479-1482, 1974.

After synchronization by double thymidine blocking, cyclic AMP concentrations and protein kinase activities were measured in HeLa(S_3) cells. Cyclic AMP concentrations were measured by determining the activity of a cyclic AMP-dependent protein kinase extracted from the uterus of a heifer, and the values thus obtained were corrected by taking into account the yield from extraction, purification and concentration and the protein content of the samples. The mean concentration of cyclic AMP in HeLa cells was 7 ± 1 pM/mg protein; this was about the same as cyclic AMP concentrations previously measured in transformed cells but was significantly lower than those found in normal cells. During the S and G phases, cyclic AMP concentrations decreased, reaching a minimum at mitosis (5.4 ± 0.3 pM/mg protein), increased rapidly during the G_1 phase (8.9 ± 0.5 pM/mg protein), and then decreased again (7.3 ± 0.4 pM/mg protein). Because of imperfect synchronization and because measurements were made on unpurified preparations, values obtained for protein kinase activities were only approximate. Little variation occurred during the cell cycle: maxima occurred at the end of the G_2 phase and during mitosis (30% increase). In the presence of 1 μM cyclic AMP, these activities were increased by 5-10% throughout the entire cell cycle.

4124 MULTIPLE CONTROL MECHANISMS UNDERLIE INITIATION OF GROWTH IN ANIMAL CELLS. *(E.)*

Jimenez de Asua, L. (Imp. Cancer Res. Fund Labs., London, England) and E. Rozengurt. *Nature* 251(5476): 624-626, 1974.

Experiments were performed to differentiate between the following hypotheses: (1) Cyclic AMP acts as a pleiotypic modulator which regulates the overall rates of all the membrane transport systems affected by changes in cell growth; and (2) Cyclic AMP may control some specific changes in membrane transport but not a general change in cell permeability. The results indicate that uridine and phosphate transport systems respond to separate control mechanism, as indicated by the differential effects produced by addition of ouabain, cycloheximide, and cyclic AMP elevating agents to mouse fibroblast. The addition of fresh serum to resting fibroblast cultures stimulates phosphate and uridine transport and brings about a large increase in 2-deoxyglucose uptake. The activation curve for 2-deoxyglucose phosphate, but not uridine, uptake was biphasic with respect to time; the early phase was unaffected by cycloheximide, while the second was completely prevented by this inhibitor. The induction of the second phase of glucose transport was not triggered by a drop in cyclic AMP, although cyclic AMP could modulate the activity of the transport system when it is already inserted in the membrane. The data indicate that distinct mechanisms of control are activated when growth is initiated and seem incompatible with a pleiotypic role for cyclic AMP in the control of all the changes in membrane transport produced by serum.

4125 ISOLATION AND CHARACTERIZATION OF REVERTANT CELL LINES. VII. DNA SYNTHESIS AND MITOTIC RATE OF SERUM-SENSITIVE REVERTANTS IN NON-PERMISSIVE GROWTH CONDITIONS. *(E.)*

Vogel, A. (Cold Spring Harbor Lab., N.Y.) and R. Pollack. *J Cell Physiol* 85(1):151-162, 1974.

The ability of Balb/c and Swiss mouse 3T3 cells, simian virus 40 (SV40)- and murine sarcoma virus (MSV)-transformed 3T3 cells, and serum-sensitive revertants of the transformed cells to synthesize DNA and enter mitosis were studied under conditions of confluence and low serum concentrations. The untransformed cells were able to maintain a constant population number under these nonpermissive growth conditions by various means: cessation of DNA synthesis, DNA synthesis coupled with failure to enter mitosis, and slow traverse of the cell cycle coupled with cell shedding. Growth control of the revertant of an MSV-transformed Balb/3T3 cell line most closely resembled that of the nontransformed 3T3 lines. This line did not grow in 1% serum and did not synthesize DNA under either nonpermissive condition. The serum-sensitive revertants of the SV40-transformed 3T3 cells were also unable to grow in 1% serum and did not grow beyond confluence in 10% serum, but these cells differed from the nontransformed 3T3 lines in the manner in which this growth arrest was accomplished. In 1% serum the revertants synthesized DNA but did not enter mitosis, while at confluence in 10% serum, they slowly traversed the cell cycle, with dividing cells replacing cells which were shed into the medium. The results suggest that a major effect of transformation is to render 3T3 cells independent of any serum requirement for the initiation of cellular DNA synthesis.

4126 MOUSE TERATOCARCINOMA: ISOLATION AND CHARACTERIZATION OF TWO MUSCLE CELL LINES. *(Fr.)*

Boon, T. (Dep. Cell Genet., Coll. France, Paris), M. E. Buckingham, D. L. Dexter, H. Jakob and F. Jacob. *Ann Microbiol* [*B*] *(Paris)* 125(1):13-28, 1974.

Two clonal cell lines were isolated from "embryoid bodies" (teratoma cells resembling embryos in the blastula stage) from two transplantable mouse teratomas. The PCD2 line, isolated from Stevens OTT-60-50-970 teratoma in 129/Sv mice, resembled skeletal muscle myoblasts. In dense cultures, many cells fused to form myotubes; these contained myofilaments and acetylcholine receptors. Occasionally, some myotubes contracted. Electrophoresis on polyacrylamide gel demonstrated that about 40% of protein synthesized by these cells migrated at the same rate as the principal myosin fraction from striated rat muscle. Cells of the PCD1 line, isolated from Stevens OTT-60-50 in teratoma in 129/Sv mice, never contracted or fused in culture. When they became confluent, they synthesized large amounts of myosin that had the same electrophoretic mobility as cardiac myosin. However, it was not ruled out that this myosin might be smooth muscle myosin. This suggests that PCD1 cells are myocardial in origin. Neither the PCD1 or PCD2 lines have the specific antigen present in multipotential teratocarcinoma cell lines. Both these lines have some H-2 determinants, are aneuploid, and do not induce tumors in isogeneic mice within two months after s.c. or i.p. transplantation.

4127 G-BANDING OF 3 MULTIPLE MYELOMA MARKER CHROMOSOMES. *(E.)*

Philip, P. (Univ. Hosp. Copenhagen, Denmark) and A. A. Drivsholm. *Biomedicine* 21(11):429-430, 1974.

A trypsin-Giemsa banding technique was used to study the chromosomes of 25 abnormal plasma cells taken from a patient with multiple myeloma and M-proteinemia of the IgAK-type. All of the cells studied contained a large marker chromosome which appeared to be due to a translocation between chromosomes 1 and 16. A translocation between chromosomes 1 and 15 appeared in 24 of the cells. Two of the cells carried chromosomes that appeared to be caused by reciprocal translocations between chromosome 3 and 5. It is suggested that banding techniques might be able to detect some preselection for a region or a breaking point producing metacentric or submetacentric chromosomes of the size in the A-B groups.

4128 CHROMOSOME BANDING PATTERN IN HUMAN COLONIC POLYPS. *(E.)* Mitelman, F.(Univ. Hosp., Lund, Sweden), J. Mark, P. G. Nilsson, H. Dencker, C. Norryd, and K. G. Tranberg. *Hereditas* 78(1):63-68, 1974.

Chromosomal patterns of nine biopsy specimens of five polyps from one patient with familiar polyposis coli, and four sporadic polyps from four patients obtained during routine examinations were studied in order to help elucidate chromosomal factors that might underlie neoplastic development. Conventional and Giemsa G-banding techniques were used. In the sporadic polyps, the normal chromosome number was predominant in all specimens, and in two of them, no deviant cells were observed. In contrast, chromosomal deviations were found in all of the polyposis coli specimens, and in three of them, abnormal chromosome numbers were predominant. In familial and sporadic polyps, engagement of chromosomes 8 and 14 was found. It is stated that in both types of polyps, histologic signs of invasiveness were preceded by changes in chromosomes. The authors suggest that since all of the polyps were benign adenomas, the chromosomal changes that precede their development are the same in familial and sporadic types.

4129 CONSISTENT CHROMOSOME ABNORMALITIES IN ACUTE LEUKAEMIA. *(E.)* Ford, J. H. (Kanematsu Mem. Inst., Sydney Hosp., Australia), S. M. Pittman and F. W. Gunz. *Br Med J* 4(5938): 227, 1974.

Bone marrow samples from three patients with acute myeloblastic leukemia were studied by an adaptation of Seabright's trypsin/Giemsa banding technique. All three patients exhibited similar cytological pictures - trisomy 9 with one member of the chromosome 21 pair missing or altered. One chromosome 8 was missing in each of two patients in hematological remission who had been treated for 2-12 months with cytotoxic drugs; this change was not noted in the third patient, who was in initial hemotological relapse and to whom no drugs had been given. The results suggest that acute leukemia is not "cured" when the patient is in hematological remission, but that the disease still persists. The results also support the contention that the important cytogenetic picture in this disease may be one of an imbalance between the number 8 and number 9 chromosomes in the leukemic cell.

4130 DERMATOGLYPHIC PECULIARITIES IN MEMBERS OF A HIGH-CANCER-RISK KINDRED. *(E.)* Lynch, H. T. (Creighton U. Sch. Med., Omaha, Neb.), A. R. Kaplan, A. Moorhouse, A. J. Krush and G. Clifford. *Prog Exp Tumor Res* 19:325-332, 1974.

Dermatoglyphic variables for a group of 15 females and 14 males belonging to a kindred having a high incidence of familial cancers including Hodgkin's disease, leukemia, sarcoma, breast cancer, and brain tumors were compared with data obtained from a group of 12 females and 11 male volunteers with no known first degree or second degree relatives affected with cancer. The dermatoglyphic characteristics—arches, loops, whorls—were statistically analyzed and those of the low-risk group were consistent with previous studies of unselected populations. High-risk females differed significantly from low-risk females, in having less arches, more loops, and more whorls. These differences were significant for left hands only or for both hands combined. The only significant difference in males involved the ratio of arches *versus* loops and whorls in both hands combined. The deviations in high-risk females are consistent with involvement of a prenatal factor affecting embryogenesis among high-risk kindred members. In the etiology of carcinogenesis, these data suggest a possible interaction of genetic factors and viruses with dermatoglyphic reflection of an oncogenic virus. This also implies a marker system for cancer susceptibility in cancer-prone families.

4131 CHROMOSOMES AND BREAST CANCER. *(E.)* Bishun, N. P. (Res. Dep., Marie Curie Mem. Found., Oxted, Surrey, England), R. W. Raven and D. C. Williams. *Cytobios* 10(37/38):7-10, 1974.

Measurements were carried out on the group A chromosomes of 50 metaphases from five patients with breast cancer and 50 metaphases from five normal controls. Both chromatids of the long and short arms of the homologous pair of chromosomes were measured. The total length of the four chromatids constituting the short arms of any two homologous chromosomes was designated by P, whereas Q represented the total length of the long arms. From these data the arm ratio (Q/P) and the centromeric index (P/P + Q) were calculated. Analysis of variance between each chromosome from the five patients and the five controls showed no differences in the lengths of chromosomes 1, 2, and 3 from the two sets of subjects. The results do not confirm a previous report indicating the more frequent occurrence of mismatched number 2 chromosome in breast cancer patients.

4132 SPIN-LATTICE RELAXATION TIMES FOR MIXTURES OF WATER AND GELATIN OR COTTON, COMPARED WITH NORMAL AND MALIGNANT TISSUE. *(E.)* Inch, W. R. (Ontario Cancer Treatment Res. Fdn. London Clinic, Canada), J. A. McCredie, C. Geiger and Y. Boctor. *J Natl Cancer Inst* 53(3):689-690, 1974.

It has been suggested that the spin-lattice relaxation time (T_1) measured by pulsed nuclear magnetic resonance spectroscopy can be used to detect the malignancy of a tissue. T_1s of samples of gelatin containing from 15-96% water and cotton containing from 30-80% water were measured with a Brucker nuclear magnetic resonance spectrometer operating at 30 megahertz. To determine water content, portions of the same gels used in the determination of T_1 were vacuum-dried at 37 C. A plot of water content against T_1 for gelatin followed a hyperbolic curve, which fitted a similar plot obtained with samples of regenerating liver, fetal tissue, and other normal and neoplastic tissues. A similar plot for cotton was hyperbolic and slightly lower

T_1 seemed to be related primarily to the total water content of the measured sample. The T_1 is difficult to interpret, and knowing its value for a biopsy specimen will be of secondary importance to the pathologist or therapist diagnosing or treating cancer in patients.

4133 SERUM OESTRADIOL-17β IN WOMEN WITH BENIGN AND MALIGNANT BREAST DISEASE. *(E.)* England, P. C. (Univ. Hosp. South Manchester, England), L. C. Skinner, K. M. Cottrell and R. A. Sellwood. *Br J Cancer* 30(6):571-576, 1974.

Serum estradiol-17β concentrations were measured daily throughout one menstrual cycle in 32 normal women, 31 women with benign disease of the breast, and 10 with cancer of the breast. The concentrations differed significantly from normal in women with cysts and to a lesser extent in those with cancer of the breast. In those with cysts, the concentrations were significantly high during the luteal phase of the cycle and 2 women in the 40-49 age group had exceptionally high values (190.2 pg/ml and 120.4 pg/ml). In the luteal phase, the overall mean difference was 18.0 pg/ml for women with cysts and 9.0 pg/ml for women with cancer of the breast. In postmenopausal women, estradiol 17β concentrations were consistently low both in 25 normal women (5.78 pg/ml) and in 27 women with cancer of the breast (7.38 pg/ml).

4134 MULTIPLE NEVOID BASAL CELL CARCINOMA SYNDROME. REPORT OF FIVE CASES IN A FAMILY. *(E.)* Kozlowski, K. (Roy. Alexandria Hosp. Child., Sydney, Australia), P. Baker and M. Classon. *Pediatr Radiol* 2(3):185-190, 1974.

4135 BREAST TUMOR CELL LINES FROM PLEURAL EFFUSIONS. *(E.)* Cailleau, R. (M. D. Anderson Hosp., Tumor Inst., Houston, Tex.), R. Young, M. Olive and W. J. Reeves, Jr. *J Natl Cancer Inst* 53(3):661-674, 1974.

4136 HUMAN BREAST TUMOR CELL LINES: IDENTITY EVALUATION BY ULTRASTRUCTURE. *(E.)* Buehring, C. C. (Sch. Publ. Health, U. California, Berkeley) and A. J. Hackett. *J Natl Cancer Inst* 53(3):621-629, 1974.

4137 NUCLEAR MAGNETIC RESONANCE STUDIES OF CANCER. V. APPEARANCE AND DEVELOPMENT OF A TUMOR SYSTEMIC EFFECT IN SERUM AND TISSUES. *(E.)* Hollis, D. P. (Johns Hopkins U. Sch. Med., Baltimore, Md.), L. A. Saryan, J. S. Economou, J. C. Eggleston, J. L. Czeisler and H. P. Morris. *J Natl Cancer Inst* 53(3):807-815, 1974.

4138 SERUM PROSTAGLANDIN $F_{2\alpha}$ CONCENTRATION IN THE CARCINOID SYNDROME. *(E.)* Feldman, J. M. (Duke U. Med. Ctr., Durham, N.C.), J. W. Plonk and J. C. Cornette. *Prostaglandins* 7(6):501-506, 1974.

4139 SIMULTANEOUS DEVELOPMENT OF HODGKIN'S DISEASE AND LYMPHADENOSIS. *(Ger.)* Ebner, E. (Med. Clin., Friedrich Schiller U., Jena, Germany), W. Neumann and W. Ebert. *Z Gesamte Inn Med* 29(5):211-214, 1974.

4140 LYMPHATIC METASTASIS OF TRANSPLANTABLE ANIMAL NEOPLASMS. *(E.)* Carr, I. (Dept. Path., U. Sheffield, England), F. McCinty, C. Potter and S. Westby. *Experientia* 30(2):185-186, 1974.

4141 LOCALISATION OF A FIBROBLAST GROWTH FACTOR AND ITS EFFECT ALONE AND WITH HYDROCORTISONE ON 3T3 CELL GROWTH. *(E.)* Gospodarowicz, D. (Salk Inst. Biol. Studies, San Diego, Calif.). *Nature* 249(5453):123-127, 1974.

4142 URINARY STEROID EXCRETION IN EARLY AND ADVANCED HUMAN BREAST CANCER. *(E.)* Milcu, S. M. (No affiliation), D. Drafta-Costea, E. Stroe, C. Ciocirdia, A. Tache, A. Cristoveanu, M. Bunea and E. Socoliuc. *Rev Roum Endocrinol* 10(6):505-517, 1973.

4143 TUMORIGENESIS IN OVARIAN IMPLANTS ON THE GREATER OMENTUM IN RATS: FAILURE OF ACCELERATION BY LONG-TERM "DORMANCY". *(E.)* Ber, A. (Beilinson Hosp., Petah-Takva, Israel). *Endokrinologie* 62(1):49-54, 1973.

4144 FERROKINETICS IN MAMMARY GLANDS OF BALB/C MICE. *(E.)* Singh, D. V. (Detroit Inst. Cancer Res., Mich.), S. Albert, L. Halmi and L. Calhoun. *Endokrinologie* 61(2):297-306, 1973.

4145 THYROID PROTEINS AND HORMONE SYNTHESIS IN HUMAN THYROID CANCER. *(E.)* Thomas-Morvan, C. (Gustave-Roussy Inst., Villejuif, France), B. Nataf and M. Tubiana. *Acta Endocrinol* 76(4):651-669, 1974.

4146 PAPANICOLAOU SMEAR OF CULTURED HUMAN TUMOR CELLS. *(E.)* Hajdu, S. I. (Mem. Sloan-Kettering Cancer Ctr., New York, N.Y.), M. A. Bean, J. Fogh, E. O. Hajdu and A. Ricci. *Acta Cytol* 18(4):327-332, 1974.

4147 HYPOPLOIDY IN BRAIN TUMOURS. *(E.)* Dharker, R. S. (G. R. Med. Coll., Bwalior, India), B. D. Chaurasia and H. K. Goswami. *Acta Biol Acad Sci Hung* 24(3/4):233-235, 1973.

4148 PRIMARY LIVER CARCINOMA. *(E.)* Linder, C. T. (Louisiana State U. Sch. Med., New Orleans), J. N. Crook and I. Cohn, Jr. *Cancer* 6(33):1624-1629, 1974.

4149 THE AGEING, GROWTH AND DEATH OF CELLS. *(E.)* Sheldrake, A. R. (Dept. Biochem., U. Cambridge, England). *Nature* 250(5465):381-385, 1974.

4150 CHARACTERISTICS OF AN ESTABLISHED CELL LINE OF RETINOBLASTOMA. *(E.)* Reid, T. W. (Yale J. Sch. Med., New Haven, Conn.), D. M. Albert, A. S. Rabson, P. Russell, J. Craft, E. W. Chu, T. S. Tralka and J. L. Wilcox. *J Natl Cancer Inst* 53(2):347-360, 1974.

4151 THE UNDIFFERENTIATED AND EXTENDED FORMS OF C1300 MURINE NEUROBLASTOMA. AN ULTRASTRUCTURAL STUDY AND DETECTION OF CONCANAVALIN A BINDING SITES ON THE PLASMA MEMBRANE. *(E.)* Graham, D. I. (U. Pennsylvania Sch. Med., Philadelphia), N. K. Gonatas and F. C. Charalampous. *Am J Pathol* 76(2): 285-312, 1974.

4152 MALIGNANCY IN PLEOMORPHIC ADENOMA. A CLINICAL AND MICROSPECTROPHOTOMETRIC STUDY. *(E.)* Eneroth, C. M. (Karolinska Inst., Stockholm, Sweden) and A. Zetterberg. *Acta Otolaryngol (Stockh)* 77(6): 426-432, 1974.

4153 PLASMA AND URINARY DEHYDROEPIANDROSTERONE IN CANCER. *(E.)* Sonka, J. (Fac. Med., Charles U., Prague, Czechoslovakia), M. Vitkova, I. Gregorova, Z. Tomsova, J. Hilgertova and J. Stas. *Endokrinologie* 62(1):61-68, 1973.

4154 KAPOSI SARCOMA IN AFRICAN CHILDREN. *(E.)* Grave, G. F. (Mpilo Central Hosp., Bulawayo, Rhodesia). *Ann R Coll Surg Engl* 54(6):270-271, 1974.

4155 REGULATION OF TRANSLATION IN EUKARYOTIC CELLS. I. EFFICIENCY OF CELL SAP FROM NORMAL AND TUMOR TISSUES ON RIBOSOMAL PROTEIN SYNTHESIS. *(Ger.)* Bielka, H. (Dept. Cell Physiol., East German Acad. Sci., Berlin). *Acta Biol Med* 32(2/3):175-180, 1974.

4156 PRIMARY HEPATIC CANCER IN CHILDHOOD. *(E.)* Sinniah, D. (Roy. Children's Hosp., Parkville, Australia), P. E. Campbell and J. H. Colebatch. *Arch Dis Child* 49:494-498, 1974.

4157 ANDROGEN ASSIMILATION BY NORMAL AND HYPERPLASTIC DOG PROSTATE GLANDS. *(E.)* Mawhinney, M. G. (West Virginia U. Med. Ctr., Morgantown), F. L. Schwartz, J. A. Thomas and J. W. Lloyd III. *Invest Urol* 12(1):17-22, 1974.

4158 THE METABOLISM OF CALCIUM AND PHOSPHORUS AND THE CELLULAR LIPOPROTEINS OF THE EHRLICH'S ASCITES TUMOR CELL. *(E.)* Anghileri, L. J. (Essen Clin. Tumor Res., Germany). *Int J Clin Pharmacol* 10(1):23-29, 1974.

4159 TWO CASES OF MALIGNANT OVARIAN TUMORS IN GIRLS. *(Rus.)* Berezin, I. F. (No affiliation). *Vestn Khir* 112(2):93-95, 1974.

4160 INVASION OF LIVER TISSUE BY BLOOD-BORNE MAMMARY CARCINOMA CELLS. *(E.)* Dingemans, K. P. (Netherlands Cancer Inst., Amsterdam). *J Natl Cancer Inst* 52/53(1/6):1813-1824, 1974.

4161 SHORT-TERM EFFECTS OF FREE FATTY ACIDS ON THE REGULATION OF FATTY ACID BIOSYNTHESIS IN EHRLICH ASCITES TUMOR CELLS. *(E.)* McGee, R. (Dep. Biochem., Univ. Iowa, Iowa City) and A. A. Spector. *Cancer Res* 34(12):3355-3362, 1974.

4162 CIRCADIAN VARIATION IN MITOSIS AND CELL NUMBERS IN THE NEAR PLATEAU GROWTH PHASE OF EHRLICH ASCITES TUMOR. *(E.)* Brown, H. R. (New York Med. Coll., Valhalla, N. Y.). *Growth* 38(4): 413-419, 1974.

4163 SERUM OESTRADIOL-17β IN NORMAL WOMEN. *(E.)* England, P. C. (Univ. Hosp. South Manchester, England), L. G. Skinner, K. M. Cottrell and R. A. Sellwood. *Br J Cancer* 29(6):462-469, 1974.

4164 SLOW ENTRY INTO BLOOD OF ESTRONE PRODUCED IN EXTRAGLANDULAR SITE(S) IN OBESITY AND ENDOMETRIAL NEOPLASIA. *(E.)* Edman, C. D. (Univ. Texas Southwest. Med. Sch. Dallas) and P. C. MacDonald. *Gynecol Invest* 5(1):27, 1974.

4165 HEMATOPOIETIC INVOLVEMENT OF THE SPLEEN IN TUMOR BEARING MICE. *(Ger.)* de Kastner, M. R. Q. (Oswaldo Cruz Inst., Rio de Janeiro, Brazil) and L. Cardeman. *Arch Geschwulstforsch* 43(1):1-7, 1974.

4166 PAPILLOMA OF THE LARYNX AND TRACHEA IN CHILDREN. *(E.)* Mounier-Kuhn, P. (Otorhinolaryngol. Audiophonol. Clin., Lyon, France), J. Gaillard, P. Dumolard and A. Mounier-Kuhn. *Int Surg* 59(9):483-486, 1974.

4167 THE EFFECT OF BOVINE GROWTH HORMONE ON GROWTH OF MAMMARY TUMORS IN HYPOPHYSECTOMIZED RATS. *(E.)* Li, C. H. (Hormone Res. Lab., U. California, San Francisco) and W. H. Yang. *Life Sci* 15(4):761-764, 1974.

4168 THE MEASUREMENT OF THE STATIONARY OX-RED POTENTIALS IN THE LIPIDS OF LIVER DURING CARCINOGENESIS. *(Rus.)* Tarusov, B. N. (Biol. Fac., M. V. Lomonosov Moscow State U., USSR), V. I. Novikov and Y. M. Petrusevich. *Biofizika* 19(1):112-115, 1974.

4169 ON THE ESTIMATION OF CHANGES IN BLOOD DURING CANCER WITH THE HELP OF RADIATION CHEMISTRY. *(Rus.)* Sharpatyi, V. (Inst. Chem. Phys., USSR Acad. Sci., Moscow) and N. Zakatova. *Biofizika* 19(1):186-188, 1974.

4170 RELATIONSHIP OF ECTOPIC PLACENTAL ALKALINE PHOSPHATASE TO ECTOPIC CHORIONIC GONADOTROPIN AND PLACENTAL LACTOGEN. DISCORDANCE OF THREE "MARKERS" FOR CANCER. *(E.)* Sussman, H. H. (Stanford U. Med. Ctr., Calif.), B. D. Weintraub and S. W. Rosen. *Cancer* 33(3):820-823, 1973.

4171 G-BAND ANALYSES OF AN ESTABLISHED CELL LINE OF A HUMAN MALIGNANT GLIOMA. *(E.)* Mark, J. (Central Hosp. Skovde, Sweden), J. Ponten and B. Westermark. *Humangenetik* 22(4):323-326, 1974.

4172 PHYSIOLOGICAL COMPARISONS OF TRANSFORMED (CROWN GALL) AND NONTRANSFORMED *VINCA ROSEA* L. CELLS. *(E.)* Manasse, R. J. (Boyce Thompson Inst., Yonkers, N.Y.). *In Vitro* 9(6):434-440, 1974.

4173 ELECTRONIC PROPERTIES OF N-HETEROAROMATICS. III. FLUORESCENCE QUENCHING OF DNA BY CARCINOGENIC QUINOLINES. *(E.)* Okano, T. (Pharm. Inst., Tohoku U., Japan), H. Matsumoto, A. Takadate and T. Horie. *Gann* 65(2):187-190, 1974.

4174 VARIATION IN THE MODE OF SUGAR TRANSPORT AMONG NORMAL AND TUMOR CELLS. *(E.)* Hino, S. (Inst. Med. Sci., U. Tokyo, Japan) and T. Yamamoto. *Gann* 65(2):183-185, 1974.

4175 MUCINOUS CARCINOID TUMOR OF THE VERMIFORM APPENDIX. *(E.)* Klein, H. Z. (Mt. Zion Hosp., San Francisco, Calif.). *Cancer* 33(3):770-777, 1973.

4176 THE ULTRASTRUCTURE OF CLEAR CELL ADENOCARCINOMA OF ENDOMETRIUM. *(E.)* Rorat, E. (Coll. Physicians Surg., Columbia U., New York, N. Y.), A. Ferenczy and R. M. Richart. *Cancer* 33(3):880-887, 1973.

4177 THE RELATIONSHIP BETWEEN DIFFERENTIATING MEDULLOBLASTOMA AND REDIFFERENTIATING DIFFUSE CEREBELLAR ASTROCYTOMA. LIGHT, ELECTRON MICROSCOPIC, TISSUE, AND ORGAN CULTURE OBSERVATIONS. *(E.)* Rubinstein, L. J. (Stanford U. Sch. Med., Calif.), M. M. Herman and J. W. Hanbery. *Cancer* 33(3):675-690, 1973.

4178 GIANT CELLS AND ATYPICAL MITOSES IN CELL CULTURE DERIVED FROM A HUMAN MALIGNANT MELANOMA OF THE CHOROID. *(E.)* Vrba, M. (Fac. Med., J. E. Purkyne Univ., Brno, Czechoslovakia) and J. Bucek. *Folia Biol (Praha)* 20(4):258-261, 1974.

4179 CHARACTERIZATION OF MALIGNANT THYROID GLAND TISSUE BY MAGNETIC RESONANCE METHODS. *(E.)* Schara, M. (Inst. "Jozef Stefan", Univ. Ljubljana, Yugoslavia), M. Sentjurc, M. Auersperg and R. Golouh. *Br J Cancer* 29(6):483-486, 1974.

4180 GARDENER'S SYNDROME: REPORT OF A FAMILY. *(E.)* Koren, E. (Ichilov Municipal-Government Med. Ctr., Tel Aviv, Israel), A. Lazarovitch, M. Baratz, M. Loewenthal and M. Solowiejczyk. *Ann Surg* 180(2):198-202, 1974.

4181 CEREBRAL RHABDOMYOSARCOMA. *(E.)* Marsden, H. B. (Roy. Manchester Children's Hosp., England). *Arch Dis Child* (49):498, 1974.

4182 NOTE ON MIXED TUMOURS OF THE SKIN. *(E.)* Vittori, F. (Hotel-Dieu Hosp., Lyon, France), F. Lebros, J Beurlet and G. Moulin. *Arch Anat Pathol* 22(2):105-110, 1974.

4183 SCLEROSING PAPILLARY PROLIFERATIONS IN THE FEMALE BREAST. A BENIGN LESION OFTEN MISTAKEN FOR CARCINOMA. *(E.)* Fenoglio, C. (Columbia U., Coll. Physicians Surg., New York, N.Y.) and R. Lattes. *Cancer* 33(3):691-700, 1973.

4184 GENETIC DIFFERENCES IN THE AROMATIC HYDROCARBON-INDUCIBLE N-HYDROXYLATION OF 2-ACETYLAMINOFLUORENE (2-AAF) IN MICE. *(E.)* Thorgeirsson, S. (Natl. Inst. Health, Bethesda, Md.) and D. W. Nebert. *Pharmacologist* 16(2):277, 1974.

4185 AMINO ACID UPTAKE INTO HUMAN BRAIN TUMORS. *(E.)* Snodgrass, S. R. (Dept. Pharmacol., Cambridge U., England) and L. L. Iversen. *Brain Res* 76(1):95-107, 1974.

4186 BENIGN GASTROINTESTINAL TRACT TUMORS IN NIGERIAN CHILDREN. *(E.)* Nwako, F. (U. Nigeria Teaching Hosp., Enugu). *Int Surg* 59(5):294-296, 1974.

4187 MULTIPLE SEBACEOUS GLAND TUMORS AND INTERNAL CARCINOMA: TORRE'S SYNDROME. *(E.)* Bitran, J. (Rush-Presbyterian-St. Luke's Med. Ctr., Chicago, Ill.) and E. V. Pellettiere. *Cancer* 33(3):835-836, 1973.

4188 HEREDITARY TUMORS OF THE CAROTID BODIES AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE. *(E.)* Chedid, A. (Cincinnati Gen. Hosp., Ohio) and W. Jao. *Cancer* 33(6):1635-1641, 1974.

4189 INFILTRATING LIPOMAS AND ANGIOLIPOMAS REVISITED. *(E.)* Dionne, G. P. (Dept. Pathol., McGill U., Montreal, Canada) and T. A. Seemayer. *Cancer* 33(3):732-738, 1973.

4190 INTERMUSCULAR AND INTRAMUSCULAR LIPOMAS AND HIBERNOMAS. A CLINICAL, ROENTGENOLOGIC, AND PROGNOSTIC STUDY OF 46 CASES. *(E.)* Kindblom, L. G. (Dept. Pathol. II, U. Goteborg, Sweden), L. Angervall, B. Stener and I. Wickbom. *Cancer* 33(3):754-762, 1973.

191 CALCIFYING EPITHELIAL ODONTOGENIC TUMOR. A
SURVEY OF 23 CASES AND DISCUSSION OF HISTO-
DRPHOLOGIC VARIATIONS. *(E.)* Krolls, S. O. (Armed
orces Inst. Pathol., Washington, D.C.) and J. J.
indborg. *Arch Pathol* 98:206-210, 1974.

192 NUCLEASES IN HELA CELL NUCLEOPLASM AND
NUCLEOLI. *(E.)* Kwan, C. N. (Washington
. Sch. Med., St. Louis, Mo.), S. Gotoh and D. Schles-
inger. *Biochim Biophys Acta* 349(3):428-441, 1974.

193 LEIOMYOSARCOMA OF THE PROSTATE. (A CASE
REPORT). *(E.)* Narula, I. M. S. (Sardar
atel Med. Coll., Bikaner, India), B. L. Sanwal, R. K.
garwal and D. G. Ojha. *Ind J Surg* 35(9):465-466,
973.

194 GLOMUS TUMOUR. REPORT OF 2 CASES WITH RE-
VIEW OF LITERATURE. *(E.)* Shanmugasundaram,
. K. (Stanley Med. Coll., Madras, India). *Ind J*
urg 35(8):419-422, 1973.

195 BENIGN OSTEOBLASTOMA RADIUS, AN UNUSUAL BONE
TUMOUR. *(E.)* Sharma, I. D. (King George's
ed. Coll., Lucknow, India), N. N. Mahendra, P. K.
garwal and R. P. Sahi. *Ind J Surg* 35(7):370-371,
973.

196 CELLULAR CHANGES IN THE GLANDULAR EPITHELIUM
OF PATIENTS USING IUCD- A SOURCE OF CYTOLOGIC
RROR. *(E.)* Fornari, M. L. (Long Island Jewish Hosp.,
ew York, N.Y.). *Acta Cytol* 18(4):341-343, 1974.

197 ADFNOCARCINOMA OF THE LUNG. CYTOLOGIC COR-
RELATION WITH HISTOLOGIC TYPES. *(E.)* Smith,
. H. (Virginia Commonwealth U., Health Sci. Div.,
ichmond) and W. J. Frable. *Acta Cytol* 18(4):316-
20, 1974.

198 STUDIES OF A TRANSPLANTABLE CANINE SAR-
COMA. *(E.)* Bowles, C. A. (Hazleton
ab., Vienna, Va.) W. T. Kerber, S. R. S. Rangan,
. A. Woods and E. M. Jensen. *Bibl Haematol* (39):
9-157, 1973.

199 TUMOR INCIDENCE IN ICR/ALBINO AND C57/
Bl6JNIcr MALE MICE INJECTED WITH ORGAN-
SMS CULTURED FROM MOUSE MALIGNANT TISSUES. *(E.)*
iller, I. C. (Inst. Cancer Res., Philadelphia,
a.). *Growth* 38(4):507-517, 1974.

200 BRONCHIAL CARCINOID WITH CHOROIDAL METASTA-
SIS IN AN ADOLESCENT. CASE REPORT AND
LTRASTRUCTURAL STUDY. *(E.)* Fu, Y. S. (Med. Coll.
irginia, Richmond), N. B. McWilliams, T. P. Stratford
nd S. Kay. *Cancer* 33(3):707-715, 1973.

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NOTE

Journal names are abbreviated according to the list of abbreviations used by *Index Medicus*. For ournals not covered by *Index Medicus*, the abbreviations (with some modifications) found in *World Medical eriodicals*, 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jap.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
In.	Indonesian	Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone	mg	milligram(s)
ADP	adenosine diphosphate	min	minute(s)
AMP	adenosine monophosphate	ml	milliliter(s)
ATP	adenosine triphosphate	mm	millimeter(s)
C	degrees centigrade	MTD	maximum tolerated dose
cm	centimeter(s)	ng	nanogram (10^{-9})
CNS	central nervous system	pg	picogram (10^{-12})
cpm	counts per minute	p.o.	orally
DNA	deoxyribonucleic acid	ppm	parts per million
e.g.	for example	r	Roentgen
g	gram(s)	RBC	red blood cells (erythrocytes), red blood count
μg	microgram(s)	resp.	respectively
hr	hour(s)	RNA	ribonucleic acid
i.m.	intramuscular	s.c.	subcutaneous
i.p.	intraperitoneal	sec	second(s)
IU	international unit(s)	U	unit(s)
i.v.	intravenous	UV	ultraviolet
kg	kilogram(s)	WBC	white blood cells (leukocytes), white blood count
LD$_{50}$	median lethal dose(s)	wk	week(s)
m	meter(s)	wt	weight(s)
M	molar	yr	year(s)
mEq	milliequivalent(s)		
mM	millimolar		
μM	micromolar		
mC,μC	milli-,microcurie(s)		

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4)1 THE ROLE OF CHEMICALS IN HUMAN CANCER: DIETARY FACTORS.

(E.) Wogan, G. N. (Dep.
Nr. Food Sci., Massachusetts Inst. Technol.,
Cbridge). *Proc Fifth Int Symp Biol Characteriza-
tn Hum Tumors, Bologna, April 4-6, 1973* pp. 95-
1), 1974.

Areview is presented of those chemicals (known to
b carcinogenic for animals) which are associated
wth foods as additives, normal components, or con-
tminants. These include nitrosamines and nitrosa-
mies, cyclamates, saccharin, FD and C Red No. 2,
sfrole, cycasin and its aglycone methylazoxymetha-
cl, bracken fern, pyrrolizidine alkaloids, afla-
txins and sterigmatocystin. Direct evidence of
crcinogenetic risk to man is lacking in all cases
ad must rest on estimates of human exposure and
eidence of carcinogenicity in animals. (81
rferences)

402 ACTIVATION AND INACTIVATION OF CHEMICAL CARCINOGENS AND MUTAGENS IN THE MAMMAL.

.) Magee, P. N. (Middlesex Hosp. Med. Sch., London,
gland). *Essays Biochem* 10:105-136, 1974.

ochemical processes that can influence the outcome
exposure of mammals to chemicals able to induce
ncer or mutation are reviewed. These processes
clude the absorption and distribution of the chemi-
l in the body, the capacity of the different organs
metabolize it, the possible role of the liver in
termining effects in other organs, the balance be-
een the production of mutagenically or carcinogeni-
lly active products and products without such ef-
cts, the existence of repair mechanisms at the
lecular level and possible immunological defense
chanisms against the cancer cell. Chemical car-
nogens considered in relation to these processes
clude polycyclic hydrocarbons, aflatoxins, aromatic
ines, nitrosamines and nitrosamides, and methyl-
oxy-methanol glucoside (cycasin). It is concluded
at the biological and biochemical evidence dis-
ssed in this essay is consistent with the existence
exposure levels to chemical carcinogens and muta-
ns that do not result in detectable carcinogenesis
mutagenesis. (166 references)

03 POTENTIAL INHIBITORS OF COLON CARCINOGENESIS.

(E.) Wattenberg, L. W. (U. Minneso-
Sch. Med., Minneapolis). *Am J Dig Dis* 19(10):
7-953, 1974.

ographical variations in the incidence of numerous
mors may be due to alterations in levels of ex-
sure to chemical carcinogen or to changes in fac-
rs protecting the host against the effect of the
rcinogenic agent involved. Several antioxidants
ll inhibit the carcinogenic effects of a variety
chemical carcinogens. The phenolic antioxidants,
rticularly butylated hydroxyanisole (BHA) and butyl-
ed hydroxytoluene (BHT), have been the most exten-
ively studied. Studies have also been conducted with
everal sulfur-containing oxidants, two of which,
isulfiram and dimethyl-dithiocarbamate, exert a
rong inhibitory effect against neoplasia induced by
lycyclic hydrocarbons. Contradictory data have been presented regarding α-tocopherol and selenium. Many chemical carcinogens appear to have similar activation mechanisms and their ultimate carcinogenic forms have common properties. Inhibitors effective against such common features may exist, as the data for BHA and BHT suggest. A number of studies have demonstrated that it is also possible to protect against the carcinogenic effects of a diverse group of chemical carcinogens by inducing increased microsomal mixed-function oxidase activity. Most and possibly all of the mixed-function oxidase activity of the small intestine is caused by an exogenous inducer or inducers. In the small intestine, the activity of at least certain components of the microsomal mixed-function oxidase system which metabolize chemical carcinogens is determined by environmental factors; the composition of the diet as well as the amount of food consumed can profoundly alter the activity of this system. (33 references)

4204 LUNG TUMOURS IN MICE EXPOSED TO TOBACCO SMOKE.

(E.) Anonymous. *Lancet* (7879): 506, 1974.

Prolonged exposure to inhaled tobacco smoke is known to increase the incidence of adenomatous tumors in the lungs of mice of strains prone to develop these tumors spontaneously. The relevance of this model to human lung tumorigenesis by tobacco smoke is, however, highly debatable as most of these tumors are benign and do not develop in the same manner as in humans. In addition, most of the murine tumors arose from the alveolar or bronchiolar epithelium rather than the bronchial epithelium from which carcinomas arise among humans who smoke. A study by Harris *et al (Int J Cancer* 14:130, 1974), also showed an increased incidence of adenomatous lung tumors following tobacco smoke exposure in a mouse strain (C57 Bl) which does not normally develop these tumors spontaneously. The differences between smoke-exposed and control C57 mice was not as great as reported for sensitive strains, and it is possible that the increased incidence could have been due to stress from immobilization of the animals on the experimental apparatus. The claim by Harris *et al.* that they could predict which of two particular cigarettes would be more likely to cause lung cancer in humans was evidently based on poor experimental design. Their finding that there was no difference between filtered and unfiltered smoke in inducing mouse lung tumors, suggesting the presence of significant amounts of carcinogen in the vapor phase, was at variance with other published work. Thus, the search continues for a suitable mouse model system for long-term studies of the effect of inhaled tobacco smoke. (10 references)

4205 CIGAR AND PIPE SMOKING AS CONTRIBUTING CAUSES OF LUNG CANCER, CORONARY ARTERY DISEASE, AND TOTAL EXCESS MORTALITY.

(Ger.) Abelin, T. (Inst. Social Preventive Med., U. Bern, Switzerland) and O. Gsell. *Schweiz Med Wochenschr* 104(31):1098-1103, 1974.

Epidemiological surveys demonstrating relationships between cigar, cigarillo, and pipe smoking and lung cancer, coronary artery disease, and total excess mortality in Switzerland and other European countries with high cigar and pipe tobacco consumption are reviewed. A survey of smoking habits in male lung cancer patients revealed percentages of cigar and tobacco smokers over 50% in the Netherlands, over 30% in Germany and Switzerland, about 20% in Norway, and around 10% in Belgium, Northern Ireland, and Cuba. The percentage of cigar and pipe smokers among cancer patients was between 1 and 4% in France, Finland, Great Britain, and the USA. The percentage of nonsmokers among male lung cancer patients was negligible, while those of cigarette smoker, and also of cigar, cigarillo, and pipe smokers was significantly increased, relative to the general population. Pipe smoking is related to cheilocarcinoma, while cigar smoking may cause cancer of the larynx and pharynx. No relationship between carcinoma of the bladder and cigar and pipe smoking was established. Pipe and cigar smoke condensates were found to be more powerful carcinogens than cigarette smoke condensates on the skin. The carcinogenic activity of cigar smoke is believed to be comparable with that of cigarette smoke. Therefore, cigars and pipes are not to be unreservedly recommended as a substitute for cigarette smoking. (27 references)

4206 NITROSAMINES IN SEARCH OF TUMOURS. *(E.)* Anonymous. *Food Cosmet Toxicol* 12(2):251-268, 1974.

Recent work on the carcinogenicity of nitrosamines and nitrosamides is reviewed. *N*-Nitrosopiperidine produces cancer in both the esophagus and liver of rats, nitrosopyrolidine produces hepatocellular carcinomas and testicular tumors in rats, and butyl-(4-hydroxybutyl)nitrosamine produces bladder tumors in mice, lethal tumors developing earlier in males than females. Diethylnitrosamine (DENA) and dibutylnitrosamine (DBNA) cause carcinomas in the nasal cavities and squamous-cell papillomas in the larynx, trachea, and stem bronchi in adult hamsters and the offspring of treated hamsters; the induction periods are longer in the offspring. Dimethylnitrosamine also induces tumors in a variety of tissues, the tumor sites varying with the route of administration. Many nitrosamines produce tumors in a variety of species. Unlike the nitrosamines, the nitrosamides produce tumors of the CNS in newborn and adult animals; ethylnitrosourea (ENU) is considerably more potent in this respect that methylnitrosourea (MNU). The tumors produced by MNU differ histologically in different strains of mice. N-Propylnitrosourea and N-butylnitrosourea also produce tumors of the CNS, the site of the tumors differing with species. N,N'-dimethylnitrosourea produces CNS tumors in rats and mice, but not in hamsters. The claim that the alkylation of nucleic acids is of fundamental importance in the induction of cancer has not been substantiated; nor has the claim that immunosuppression is a characteristic of chemical carcinogens. (30 references)

4207 IMPLICATION OF MYCOTOXINS FOR HUMAN HEALTH. *(E.)* Campbell, T. C. (Dep. Biochem. Nutr., Virginia Polytech. Inst. State Univ., Blacksburg) and L. Stoloff. *J Agric Food Chem* 22(6):1006-1015, 1974.

The implication of mycotoxins, especially aflatoxins, for human health is reviewed. It has been demonstrated that toxins in the absence of visible molds could produce effects (carcinogenesis and organ damage) after chronic exposure. Only a few cases of acute mycotoxicoses in humans have been recorded. The estimated risk to humans has been based on studies of various species of animals, especially primates, and on incidents affecting humans. In determining the risk to humans the authors consider comparative metabolic studies, primate studies, human studies, and epidemiological studies. No conclusive statements can be made because of the many questions raised, i.e. genetic differences in susceptibility, natural selection, age and sex susceptibility, and metabolic differences. Other mycotoxins that have been implicated as harmful to human health are sterigmatocystin, patulin, penicillic acid, the trichothecene group, luteoskyrin, and citrinin. (90 references)

4208 CARCINOGENIC PROPERTIES OF IMPLANTED FOREIGN BODIES. *(Ger.)* Brand, G. (U. Minnesota Med. Sch., Minneapolis) and I. Brand. *Fortschr Med* 91(30):1181-1184, 1973.

Studies on tumor induction by implanted foreign bodies are reviewed. Foreign body-induced sarcomas have a latency period of 10-40 yr in humans. A direct relationship between tumor incidence and the size of the implant was established in animals. Humans and guinea pigs are less susceptible to tumor induction by foreign bodies than are mice and rats. The tumor incidence was found to be highest in the s.c. tissue in mice and in the serous membranes in humans. Perforated and pulverized foreign bodies, and bodies with rough surfaces account for reduced or no tumor incidence, while implants with solid, contiguous, and smooth surfaces are most likely to induce sarcomas. Virus type A and C particles were detected in foreign body-induced sarcomas under special experimental conditions, following transplantation of the foreign body or of the surrounding reactive tissue. Development of sarcoma from transplanted fibrous capsules formed around implanted foreign bodies was observed. Sarcoma cells are localized in the capsule surrounding the implant and on the surface of the latter. Transplants of the original implant often induced fully identical and homologous sarcomas regarding histological appearance, degree of anaplasia, latency period, morphological growth characteristics, and specific chromosome count and morphology, which is indicative of the presence of clones of identical preneoplastic cells in the original transplant. Specifically determined preneoplastic parent cells participate in the normal reaction to foreign bodies from the very beginning even though the genesis of sarcoma may take several months or years. Foreign-body-reactive macrophages and fibroblast-like cells were found to originate from irradiation-sensitive bone marrow cells, while preneoplastic parent cells originate from radiation-sensitive cells, or immigrate from the tissue surrounding the foreign body. The inhibition of the migration of certain macromolecules participating in intracellular communication may be an etiological factor in the genesis of foreign body-induced sarcomas, while the egree of vascularization and the electrostatic arge on the surface of the foreign body may be rrelevant etiologically. (24 references)

209 SELENIUM: A REVIEW.

(E.) Coles, L. E. (Inst. Prev. Med., Cardiff, Wales). *J Assoc blic Anal* 12(3):68-72, 1974.

itritional requirements and the consequences of an xcess of selenium are reviewed and methods for the etermination of selenium in biological substrates re covered. The nutritional requirement lies in the ange of 0.1 to 0.3 ppm of selenium. In moderately xcessive quantities selenium can be an extremely oxic element. A survey carried out in more than 100 amilies in a seleniferous area showed that chronic elenium poisoning caused bad teeth, yellowish disoloration of the skin, skin eruptions, chronic arthitis in some, diseased nails and s.c. edema. Under rdinary conditions the threshold of toxicity to anials and probably also for man is 3-4 ppm in the diet; ore recently it has been stated that a concentration f 5 ppm in common foods or 1/10 this amount in milk r water is potentially dangerous. It is probable hat continued ingestion of 5-10 mg/day would lead to ervous symptoms and gastro-intestinal disorders. hile small amounts of selenium are essential for roper nutrition and selenium deficiency may be more idespread than suspected in the past, there is evience that in certain circumstances (not discussed in his review) the element and its compounds are carinogenic. Several methods for the determination of elenium are described including colorimetry, atomic bsorption, gas/liquid chromatography, spectrophotoetry, and fluorescence. The method chosen as the standard for the analysis of raw, potable, and waste water consists of isolation of the selenium by ion-exchange and subsequent determination as the colloidal element produced by reduction with either ascorbic acid or hydrazine sulfate. The method of choice for selenium in biological materials is wet oxidation of defatted material followed by fluorimetric determination using diaminonaphthalene. (26 references)

4210 RADIATION-INDUCED LEUKEMIA IN MAN.

(E.) Modan, B. (Tel Aviv Univ. Med. Sch., Israel) and E. Lubin. *Ser Haematol* 7(2):192-210, 1974.

Problems of radiation-induced leukemia in man are reviewed with emphasis on irradiation dose, rate, and quality; individual susceptibility; and methodological considerations in estimating the actual risk in human population studies. Major population studies on the relationship of ionizing radiation to leukemia are summarized; dose rates (external and bone marrow), relative and absolute risks, and increase in relative risk/rem are given for each study. Estimates of absolute risks obtained for a wide range of exposure doses (40-400 R) are quite similar and compatible with a linearity model. Differences in the absolute risk of adults (1.5 X 10^6/yr), children under ten yr (3 X 10^6/yr), and fetuses (20-30 X 10^6/yr) may imply differential susceptibility. A high risk in polycythemia vera patients is attributed to a higher suceptibility. The lack of an increased risk at very high doses is related to the killing effect, while the absence of a leukemogenic effect in some prenatally exposed children suggests probable host immunity. The best estimate of the latent period between exposure and clinical onset of leukemia is about seven yr. Radiation-induced leukemia is not limited to an acute manifestation of the disease or to one specific cell type. Problems in population studies include loss to follow-up, absence of uniform diagnostic criteria, absence of multidisciplinary collaboration, and the size of the population studied. Since the incidence of leukemia is less than ten new cases/100,000 population/yr, a doubling or even a tripling effect will result in a relatively small number of additional cases. Consequently, failure to demonstrate a statistically significant difference is not proof of lack of a causal effect. (111 references)

4211 VIRUSES AS A FACTOR OF EVOLUTION: EXCHANGE OF GENETIC INFORMATION IN THE BIOSPHERE.

(E.) Zhdanov, V. M. (Acad. Med. Sci., Moscow, U.S.S.R.) and T. I. Tikchonenko. *Adv Virus Res* 19:361-394, 1974.

Transformations occur in nature with a direct exchange of genetic information between different strains and species of microorganisms. Transformation in prokaryotes indicates a special evolutionary device for consumption of polymer native DNA from the environment in which the possibility of integration of consumed DNA into the genome is envisaged. In studying transformation in eukaryotes, it is often not clear whether the effect is a result of integration of the transforming DNA into the genome of the recipient cell or due to reversion caused by selective conditions and a nonspecific effect of DNA. In heterokaryons of somatic cells there is an exchange of genetic information both in intraspecies and interspecies combinations. Viruses are considered obligate genetic parasites and thus able to attack all existing species of enterobacteria, while some viruses affect a wide range of evolutionarily distant hosts. During an infection caused by temperate DNA-containing phages, the virus genome is incorporated into the bacterial chromosome and replicated with the bacterial chromosome. From the evolutionary standpoint, temperate viruses and lysogenization are interpreted as a step in the virus-cell relationship where a kind of symbiosis may be discerned. In phages, transduction is usually associated with integration of DNA into the host chromosome, but the existence of prophage DNA as immunity-providing plasmids is an alternative possibility. Sex differentiation in bacteria regarding the F factor may be looked upon as an evolutionary device for genetic information exchange developed by nature with the help of viruses. Oncogenic viruses may either cause an acute infection fatal to the cell, or its genome may be incorporated into the cell genome, manifesting itself by producing specific cancer antigens which are apparently responsible for many properties of the transformed tumor cell. Oncornavirus virogens integrated into cell genomes may play an important role in the differentiation and regeneration processes interfering with cell cycle stages which require a temporary removal of contact inhibition. Future research into the ecology of viruses may determine the source of foreign information which is transferred by viruses to man. (144 references)

4212 THE CELL SURFACE AND MALIGNANT TRANSFORMATION. *(E.)* Pollack, R. E. (Cold Spring Harbor Lab., N.Y.) and P. V. C. Hough. *Annul Rev Med* 25:431-446, 1974.

Properties of cells transformed by DNA or RNA tumor viruses have been described in detail, but mechanisms for maintenance of the transformed state remain unknown. New lines of research, much of it involving experiments on the surface of normal and malignant cells, are beginning to suggest possible mechanisms. A synthesis of results obtained at different laboratories working on widely different biologic systems is presented. Membrane proteins and glycoproteins, cyclic nucleotides, and growth stimulating factors are examined in relation to cell transformation and proliferation. Special attention is given to two missing links in the understanding of control of proliferation: (I) the sequence of biochemical events occurring during stimulation of the surface and initiation of DNA replication and (II) the sequence of biochemical events leading from the integration of the genome of the oncogenic virus into the host chromosome to modification of the surface, or to modification of the proliferation control network (1). Changes in growth, surface, and other cell parameters are discussed and two useful virus cell systems are briefly considered (SV40-3T3 cells and temperature-sensitive mutants of avian sarcoma virus-chick fibroblasts). Two cellular effects close to the transforming virus are identified. One effect is the freeing of some surface receptors that are immobilized in untransformed cells; the second is the induction of a proteolytic activity which probably acts at the cell surface and may have the effect of freeing the receptors. (91 references)

4213 NEUROBLASTOMA: POSSIBLE VIRAL AETIOLOGY? *(E.)* Anonymous. *Med J Aust* 2(1):3-4, 1974.

Experimental evidence indicates that a vaccine which imparts immunity to known oncogenic viruses may also provide protection against the development of the related malignant tumors. The evidence incriminating a particular viral agent in the development of human malignancy is at present indirect. Several tumors in animals are associated with distinctive viral agents, many of which fulfill Koch's postulates as etiologic fractors. Other viruses induce malignant tumors in animals but their role in natural disease is unknown. Several viruses have been associated with human malignant tumors, but final proof of oncogenicity cannot be obtained in man. The biological principles of virus-tumor interactions have been revealed most clearly in the laboratory mouse: spontaneous leukemia in many strains has been related to a virus within the lymphoid cells of the thymus; and spontaneous mammary adenocarcinoma in mice is associated with the mammary tumor virus, a B-type RNA virus which is transmitted in the maternal milk. A further feature of animal RNA-oncogenic viruses is the presence of viral reverse-transcriptase enzyme, which enables the viral RNA genetic information to be expressed as part of the host cell DNA genome. Neuroblastoma of childhood has many features resembling those of virus-related tumors in animals. These features are consistent with the hypothesis that genetic information for at least a common neuroblastoma-associated antigen is carried by patients with clinical neuroblastoma and their relatives, although there is no proof that these genes are of viral origin or that the genetic information can be passed to other individuals. (9 references)

4214 HUMAN CANCER VIRUS VACCINES AND THE PURSUIT OF THE PRACTICAL. *(E.)* Hilleman, M. R. (Div. Virus Cell Biol. Res., Merck Inst. Therapeutic Res., West Point, Pa.). *Cancer* 34(4):1439-1445, 1974.

Present evidence indicates that cancer in man, like cancer in animals, may be infectious, and that viruses may be involved as indispensable elements. Even before proved human cancer viruses are found, vaccine development has begun with the intent of limiting viral events that lead to cancer and enhancing immunologic events that lead to elimination or destruction of cancer cells. Presently, vaccine development includes DNA and RNA viruses using human candidate cancer viruses and animal cancer viruses in animal models. Primary emphasis is being given to killed and subunit type vaccines because of their inherently greater safety and because of practical necessity in the contemporary political-scientific environment that regulates tests of vaccines in human beings. (9 references)

4215 INTRODUCTION TO VIRUS-CAUSED CANCER: TYPE C VIRUS. *(E.)* Deinhardt, F. (Dept. Microbiol., Rush-Prebyterian-St. Luke's Med. Ctr., Chicago, Ill.). *Cancer* 34(4):1363-1367, 1974.

RNA-containing, C-type viruses have been isolated from almost every class of animals; they transform cells *in vitro* and cause leukemias and sarcomas *in vivo*. Although these viruses are structurally, biochemically, and biologically similar, they can be distinguished from each other by individually characteristic nucleic acids and antigens. They are usually transmitted vertically; evidence of their presence, in the form of nucleic acid sequences homologous to viral nucleic acid sequences, may be detected in normal cells. Many C-type viruses are defective; helper viruses are needed for full viral genome expression. Human C-type leukemia or sarcoma viruses have not been identified with certainty yet, although their existence can be predicted from the results of experimental animal studies and immunologic, ultrastructural, and biochemical analyses of human tumors. (27 references)

4216 MURINE TYPE-C RNA VIRUSES: A PROPOSED RECLASSIFICATION, OTHER POSSIBLE PATHOGENICITIES, AND A NEW IMMUNOLOGIC FUNCTION. *(E.)* Aoki, T. (Natl. Cancer Inst., Bethesda, Md.). *J Natl Cancer Inst* 52(4):1029-1034, 1974.

The visualization of antigenic sites on the surface of cells and viruses by high-resolution immunoelectron microscopy has facilitated analyses of the immunologic and etiologic relationships between normal and malignant cells and type-C viruses. Although type-C viruses related to human tumors have not been discovered, studies of such viruses in other species have provided fundamental knowledge which ultimately may be applicable to the human system. Cell-surface antigens of mouse Gross, Friend, Moloney, and Rauscher leukemias possess individual specificities as shown by humoral cytotoxicity tests. It is likely that type-C viruses initiate their synthesis beneath the plasma membrane before showing any morphologic sign of budding, indicating the production of virus envelope antigen (VEA) on the cell surface itself. For the prevention of oncogenesis by type-C viruses, a broadly common VEA or a mixture of individually specific VEAs must therefore be utilized for active and/or passive host immunization. Type-C viruses appear to be involved in the pathogenicity of tumors other than leukemias and sarcomas; these include brain tumors and plasmacytomas in mice. It is likely that some alloantigens or differentiation antigens are induced by type-C viruses. Based on the unexpected diversity of their envelope antigens, a reclassification of murine type-C viruses is proposed; it may be of some general value in clarifying their virologic and immunologic functions. (49 references)

4217 EPSTEIN-BARR VIRUS AND HUMAN MALIGNANCIES. *(E.)* Henle, W. (Children's Hosp., Philadelphia, Pa.) and G. Henle. *Cancer* 34(4):1368-1374, 1974.

Epstein-Barr (EBV) has remained the foremost contender for "the first human cancer virus." It is the cause of infectious mononucleosis, which has been considered a self-limited leukemia. Self-limitation could fail to materialize on rare occasions and indeed, evidence has been mounting for an etiologic role of EBV in Burkitt's lymphoma (BL) of African children, for which an infectious cause has been postulated on the basis of epidemiologic observations. EBV might also be causally related to nasopharyngeal carcinoma (NPC). EBV fingerprints are found in nearly every BL or NPC biopsy; EBV transforms lymphocytes *in vitro* into permanently growing lymphoblasts resembling BL cells; EBV induces lymphoproliferative tumors in certain nonhuman primates; and all African BL and Chinese or other NPC patients have antibodies to various EBV-determined antigens, often at high titers, whereas controls have lower titers of some of the antibodies and lack others. Changes in the spectra and titers of antibodies reflect the clinical status and prognosis in BL and the stage of the disease and success of therapy in NPC. These facts oppose a mere passenger role of EBV, but other rare, as yet unknown factors must undoubtedly contribute to expression of its oncogenic potential. (50 references)

4218 HERPES GENITALIS AND ITS RELATIONSHIP TO CERVICAL CANCER. *(E.)* Kaufman, R. H. (Baylor Coll. Med., Houston, Tex.) and W. E. Rawls. *CA* 24(5):258-265, 1974.

The clinical features of herpes genitalis, its treatment, and its relationship to cervical cancer are reviewed. Approximately 9% of patients seen in private gynecologic practice and 22% of those treated in city-county hospitals have serologic evidence of prior herpes virus type 2 infection. Primary herpesvirus type 2 is usually acquired through sexual contact and is present as either a primary or recurrent disease. Until recently, treatment for herpesvirus infections consisted of hot sitz baths, applications of an antibiotic cream to prevent secondary infection, and analgesics. Photoinactivation of the virus is now being used as a treatment method by treating patients with 0.1% proflavine followed by immediate and repeated exposure in 18-24 hr to incandescent or fluorescent light. Efforts to isolate viruses from genital secretions and tissues of patients with cervical cancer have predominantly yielded herpesviruses, mainly herpesvirus type 2. Retrospective studies have shown that significantly more neutralizing antibodies to herpesvirus type 2 were found in women with invasive cancer than in controls. Patients with antibodies to herpesvirus type 2 are as much as 10 times more likely to have invasive cancer, up to 7 times more likely to have carcinoma *in situ*, and as much as 6 times more likely to have severe dysplasia than women without antibodies to the herpesvirus. In another study of 871 women with herpes genitalis and 562 controls who were followed from 1-6 yr, cervical dysplasia developed twice as often and carcinoma *in situ* 8 times as often, in women with herpes genitalis than in the controls. Using immunofluorescence, herpesvirus antigens have been detected in cells exfoliated from premalignant lesions of the cervix as well as carcinoma *in situ*. Antibodies to herpesvirus "nonvirion" (nonstructural) antigens have been found in the sera of women with invasive cervical cancer. Herpesvirus type 2 and some strains of herpesvirus type 1 can transform hamster cells *in vitro*. These data support the concept that herpesvirus type 2 may be an etiologic agent in the development of cervical cancer. (36 references)

4219 THE "VIRUSES OF LOVE" AND CANCER. *(E.)* Aurelian, L. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Am J Med Technol* 40(11):496-512, 1974.

This state-of-the-art of herpesviruses includes the following topics: structure and composition, infected cell, infected host, recurrent infection, diagnosis, prevention and therapy, and the relation between herpesvirus and cancer. Several herpesviruses have been associated with cancer: lymphoma of chickens, renal adenocarcinoma of frogs, and lymphoma-leukemia of nonhuman primates, rabbits and guinea pigs. Three herpesviruses are associated with cancer in man: Epstein-Barr virus associated with Burkitt's lymphoma, nasopharyngeal carcinoma, and possibly Hodgkin's disease; herpes simplex virus 1 (HSV-1) associated with cancer of the lip; and herpes simplex virus 2 (HSV-2) associated with cancer of the cervix. The association of cervical cancer with HSV-2 is discussed in some detail. Two groups of seroepidemiologic studies are described: 1) those studies which analyzed the presence of neutralizing antibody to HSV-2 in cervical cancer patients and controls, and 2) those studies which were based on the premise that malignantly transformed cells must express some virus function, whether unique to the tumor cells or unregulated in them. The virologic studies are also divided into two approaches: 1) evidence was sought for virus persistence and expression in human tumor material, and 2) the oncogenic potential of the virus in an animal model was investigated. Although the seroepidemiological and virological studies have established an association between HSV-2 and cervical cancer, definitive proof of causation is not available. (66 references)

4220 THE REPLICATION OF PAPOVAVIRUS DNA. *(E.)* Levine, A. J. (Dep. Biochem. Sci., Princeton Univ., N.J.). *Prog Med Virol* 17:1-37, 1974.

The use of the polyoma-SV40 group of viruses in the elucidation of the structure of closed circular and superhelical DNA's is reviewed as are studies on the genetic analysis of viral replication and transformation, the construction of a physical map of the viral chromosome, the study of viral DNA replication, and the patterns of transcription of viral DNA during lytic infection and in the transformed cell. Because of the limited coding capacity of the papovavirus genome it is suggested that SV40 borrows from the eukarytoic cell a number of replication functions required for its duplication process. It is expected that during the continuing study of SV40 DNA replication more will be learned about the mechanisms of eukaryotic DNA replication. SV40 DNA can integrate into the cellular genome; it is suggested that this viral DNA undergoes recombination events with the mammalian chromosomes and that this capability is derived from viral and/or cellular functions which may be employed in the DNA replication cycle itself. (155 references)

4221 TUMOR IMMUNOLOGY AND ITS APPLICATION TO THE DIAGNOSIS OF CANCER. *(E.)* Herberman, R. B. (Natl. Cancer Inst., Bethesda, Md.). *Ann Clin Lab Sci* 4(5):323-330, 1974.

There are several types of immunological approaches to the diagnosis of cancer: detection of tumor associated antigens on tumor cells or secretions or circulating in the plasma; determination of the immune competence of cancer patients; and study of the cell-mediated and humoral responses to tumor associated antigens. Of these approaches, the search for circulating tumor associated antigens has been used most extensively. Most of the emphasis has been on the detection of antigens released from the tumor cells and present in the circulating plasma or in secretions. Among the circulating antigens which have been suggested for possible diagnostic application are the carcinoembryonic antigen (CEA), alpha fetoprotein (AFP), and gamma protein. In addition, several hormones (human chorionic gonadotropin, human placental lactogen, parathyroid hormone, "big" ACTH) and other proteins (tal T-globulin, alkaline phosphatase) have shown some association with the neoplastic state. The types of assays for decreased immunological competence which might be useful in the study of cancer patients include skin tests for delayed hypersensitivity (recall antigens and primary sensitization), enumeration of circulating T and B lymphocytes, lymphocyte function tests and macrophage function tests. Skin tests for delayed hypersensitivity, cytotoxicity assays against tumor-derived target cells, studies of leukocyte migration inhibition, and detection of factors which block assays of cell-mediated immunity and antibodies against tumor antigens can be used to determine the immune response to tumor associated antigens. The potential role of there tests in screening for cancer, in differential diagnosis, and in monitoring the cancer patient after therapy remains to be determined. (64 references)

4222 THE REGULATION OF SELF-TOLERANCE: IMPLICATIONS FOR IMMUNE SURVEILLANCE AGAINST TUMOR CELLS. *(E.)* Cohen, I. R. (Weizmann Inst. Sci., Rehovot, Israel), H. Wekerle and M. Feldman. *Isr J Med Sci* 10(8):1024-1032, 1974.

Recent investigations of the physiological regulation of potentially self-reactive T lymphocytes during the development of immune activation are reviewed. Recognition of receptor-bearing self-antigens, presence of serum factors and the balance between tolerogenic and immunogenic self-reactive antigens are discussed. The soluble form of self-antigens appears to block lymphocyte receptors that may otherwise be triggered to adhere to immunogenic cell bound forms of the same antigens. However, a decrease in the relative concentration of these antigens could lead receptor-bearing lymphocytes to recognize immunogenic cell-bound antigens and could possibly induce autosensitization. It is suggested further that the same process may be exploited by tumor cells to abrogate immune surveillance. The recognition kinetics of tumor-specific antigens was studied by culturing lymphocytes *in vitro* while the effector response of sensitized lymphocytes was measured both *in vitro* and *in vivo* using inbred rats or mice. The mechanism of self tolerance may provide a new approach in tumor immunology. (40 references)

4223 IMMUNOSUPPRESSION AND CARCINOGENESIS. A REVIEW. *(E.)* Kripke, M. L. (Univ. Utah Coll. Med., Salt Lake City) and R. Borsos. *Isr J Med Sci* 10(8):888-903, 1974.

The literature dealing with the effects of immunosuppressive treatment on chemical and physical carcinogenesis in animal models is critically reviewed. Data on experimental carcinogenesis and immunosuppression is related to three questions: (1) do immunosuppressive drugs enhance carcinogenesis; (2): under what conditions does such enhancement occur; and (3) are such effects attributable to immunosuppression? The following inferences are drawn from the literature survey: (1) Immunosuppressive drugs, antimetabolites and steroids can increase, decrease, or not affect carcinogenesis; there is no way of predicting the effects of a given drug or drug regimen on carcinogenesis. Antilymphocyte serum either exerts no effect or tends to increase carcinogenesis. (2) The data do not warrant the conclusion that the observed effects of the agents on carcinogenesis are due to their immunosuppressive properties. While some of the results, especially those obtained with antilymphocyte serum, are consistent with this interetation, there are other possible interpretations t based on immunosuppressive effects. It is pointed t that all the data uncovered by this survey were tained with only three species of animals: mice, ts and hamsters. Furthermore, relatively few carnogens were tested and most of these in high doses. is concluded that it is very difficult to design periments, the results of which could be ascribed lely to the immunosuppressive effects of an agent. 5 references)

24 THE BENIGN CELLS OF MALIGNANT TUMORS. *(E.)* Pierce, G. B. (Univ. Colorado Med. Cent., nver). In: *Developmental Aspects of Carcinogenesis d Immunity* edited by T. J. King. New York: Academic ess, Inc., 1974, pp. 3-22.

developmental concept of cancer has been postulated a result of the identification of benign cells rived from malignant stem cells. This ncept supposes that normal stem cells are the rget in carcinogenesis and that the mechanisms normal cell differentiation and stabilization ply to the pathological differentiation and stalization of cells when they become cancerous. a result of alteration of genomic controls with pression and derepression of genomic loci, and oviding that the cellular environment is appropriate, the malignant phenotype eventuates. Experiments teratocarcinoma, squamous cell carcinomas, adenorcinomas, and breast carcinomas supportive of the ncept are discussed. It is concluded that the ncept of differentiation as the mechanism of carinogenesis holds for a variety of tumors, even hose of viral origin. (38 references)

225 MALIGNANT POTENTIAL OF THE DYSGENETIC GONAD. *(E.)* Schellhas, H. F. (Univ. incinnati Coll. Med., Ohio). *Obstet Gynecol* 44(2): 98-309, 1974.

he risk of humans with hermaphroditic gonadal haracteristics to the development of gonadal cancer s related to abnormal karyotypes; specifically the ale sex determining Y chromosome. The large majoriy of cases reviewed consist of gonadal dysgeneses hat contain some form of bilateral testicular funcion either as a streak gonad, gonadal tumor or deeloped testis. They also universally contain the chromosome in their karyotype. A survey of gonad ysgeneses indicates a 25% risk of developing onadal cancer, particularly gonadoblastoma. Other umors such as dysgerminomas, embryonal carcinoma nd chorionocarcinoma are reviewed with a descripion of X,Y chromosomal karyotypes. Genetic and mbryogenic events leading to gonadal dysgenesis nd other associated phenotypic changes are disussed. It is concluded that the environment proided by a genetic constitution with a Y chromosome ighly favors the development of gonadal germ cell umors. (98 references)

226 MALIGNANT DISEASE OF THE LYMPHOID SYSTEM IN IMMUNOLOGICAL PERSPECTIVE. *(E.)* Hansen, . A. (Sloan-Kettering Inst. Cancer Res., New York, .Y.) and R. A. Good. *Hum Pathol* 5(5):567-599, 1974.

Malignant disease of the lymphoid system is extensively reviewed in its relation to immunobiology. Study of the normal immune system, and especially study of immune deficiency disease, has revealed a remarkable degree of complexity within the lymphoid system, particularly at the cellular level. This complexity has precluded the precise or definitive characterization of lymphoproliferative malignant disease by morphological criteria alone. Newly available methodologies can now be used to identify distinct lymphocyte subpopulations, each population possessing a characteristic set of markers or functions. These methods are described and the origin of lymphoproliferative malignant diseases in the B, T, or M cells is discussed. New classification schemes for the malignant lymphomas that attempt to integrate cytological features with the newer functional criteria are illustrated. Modification of this terminology will probably continue until many more cases of the different lymphoproliferative malignant disorders can be analyzed with the new methodologies. (164 references)

4227 CELL KINETICS IN ACUTE LEUKEMIAS. *(Fr.)* Najean, Y. (St. Louis Hosp., Paris, France) and A. Faille. *Rev Prat* 23(1):67-89, 1973.

The index of tritiated thymidine incorporation into leukemic cells is much lower than that for normal cells, which suggests that a large fraction of cells in human leukemia are not proliferating. Mitotic cycle durations of 50 to 300 hr have been reported, and evidence shows that a synchronized cell population desynchronizes very rapidly. The duration of the cycle is perhaps a function of the rate of synthesis of certain proteins in phase G1. The index of tritiated thymidine incorporation is greater during partial remission induced by chemotherapy, suggesting that, as with normal cells, proliferation is more rapid when the density of the cell pupulation is low. Little is known of the kinetics of blast cells during remission, except that remission frequently lasts longer than would be expected if only one blast persisted and proliferated at the same rate as when the disease is active. It is probable that the exponentially decreasing Gompertz curve for the growth of tissues in general applies to the progression of leukemia. No fundamental difference has been shown for different-sized leukemic blast cells in the bone marrow; all are viable and capable of proliferation. Explanatory models of leukemia cell kinetics are discussed. (19 references)

4228 GENETICS OF CANCER. *(E.)* Heston, W. E. (Natl. Cancer Inst., Bethesda, Md.). *J Hered* 65(5):262-272, 1974.

Studies on the genetics of cancer are reviewed after discussion of the concept that an individual's development is influenced by multiple genetic and nongenetic factors. This concept is contrary to an interpretation of single-gene inheritance of cancer. Genetics as related to the etiology and treatment of cancer in man is briefly discussed with emphasis on studies of cancer genetics in animals, particularly the mouse. Studies of tumors resulting from hybridization have shown that tumors can be due to combination of genes affecting tumor development, to introduction of specific genes that increase occurrence of tumors, or to introduction of a tumor virus, specifically the mouse mammary tumor virus, into a more susceptible genetic background. Other studies which are reviewed include those of leukosis in chickens, and cancer-eye in cattle. The genetics of lung tumors and leukemia and the genetic transmission of mammary tumor virus in the mouse are discussed in greatest detail. (64 references)

4229 ON THE ORIGIN OF THE GENES FOR NEOPLASIA: G. H. A. CLOWES MEMORIAL LECTURE. *(E.)*

Temin, H. M. (McArdle Lab., Univ. Wisconsin, Madison). *Cancer Res* 34(11):2835-2841, 1974.

The protovirus hypothesis for the origin of ribodeoxyviruses is considered in answering questions concerning the change of a normal cell genome into the genome of a cancer cell. In the two groups of avian ribodeoxyviruses, avian leukosis-sarcoma viruses and reticuloendotheliosis viruses, there is wide variation in their ability to cause cancer. Carcinogenesis by these strongly transforming viruses involves the formation in infected cells of genes for cancer copied from the viral genome. Normal chicken cells do not contain infectious DNA for transformation or for virus production. Therefore, there is not an inactive provirus of a strongly transforming virus in normal chicken cells. A number of hypothesis have been proposed to explain the creation of the genes for cancer in normal cells: mutation; differentiation; oncogene; infection; and protovirus. In all the hypotheses the cancer cells contain the genes for neoplastic transformation. The hypotheses differ as to whether or not these genes are present in normal cells. The protovirus hypothesis states that the genes for neoplastic transformation arise in an organism as a result of misevolution of a normal system of DNA to RNA to DNA information transfer and that ribodeoxyviruses arise as a result of misevolution of normal cellular genes. According to the author, there is evidence from experiments involving nucleic acid hybridization and study of DNA polymerase relationships for the protovirus hypothesis for the origin of ribodeoxyviruses. (23 references)

4230 BIOLOGIC MANIFESTATIONS OF ONCOGENESIS *IN VITRO*: A CRITIQUE.

(E.) Sanford, K. K. (Natl. Cancer Inst., Bethesda, Md.). *J Natl Cancer Inst* 53(5):1481-1485, 1974.

An attempt is made to distinguish between oncogenesis *in vitro* and cell transformation. It is suggested that the term *transformed* be restricted to those cells that have been demonstrated to grow as malignant neoplasms *in vivo* or, alternatively, not to use the term unless qualified as to the type of change observed, that is, morphologic, antigenic, proliferative and so on. Two problems are considered: (1) which of the many responses of cells to oncogenic viruses or carcinogens might be associated with neoplastic transformation and serve as criteria or manifestations of oncogenesis; and (2) what are the mechanisms underlying these manifestations? Those cell responses which appear to be associated with acquisition of neoplastic potential include alterations in cell and colony morphology and changes in growth properties. The changes in growth properties include the capacity for growth in fluid or agar suspension, loss of density-dependent inhibition of growth, and enhanced growth under conditions of reduced serum concentration. These criteria of neoplastic transformation should be used cautiously and should not replace the *in vivo* assay for tumor production. It is suggested that certain of the morphologic changes and the reduced sensitivity of neoplastic cells to inhibition of growth at high cell density result from reduced cytoplasmic spreading associated with diminished adhesiveness to substrate and to adjacent cells. Loss of surface substrate dependence and changes in dynamic morphology, rather than loss of contact inhibition of locomotion or mitosis, seem to characterize the neoplastic transformation of cells *in vitro*. (76 references)

4231 EVOLUTION OF CELL SENESCENCE, ATHEROSCLEROSIS AND BENIGN TUMOURS.

(E.) Dykhuizen, D. (Res. Sch. Biol. Sci., Australian Natl. Univ., Canberra). *Nature* 251(5476):616-618, 1974.

It is proposed that cell senescence is a genetically controlled and programmed event selected by evolution and that any effects on somatic senescence is a pleiotropic effect of this function. The advantage of programmed cell senescence to the organism is that it stops cells which have escaped from normal control from dividing indefinitely. *In vitro*, normal human fibroblasts are limited in the number of divisions possible, the onset of senescence being dependent on the cell doubling age. Evidence also indicates that cells senesce *in vivo*, and that organisms age at least partially because their cells age. Limitation in the size of atherosclerotic plaques provides a strong selection for cell senescence. It is suggested that atherosclerotic plaques arise from cells which escape into the arteries, settle and start growing. To keep these plaques at a minimum size, evolution has selected for a limitation on the number of cell divisions. Limitation in the size of some benign tumors (e.g., leiomyomas) could also provide strong selection for cell senescence. This theory makes several predictions which are open to testing: atherosclerotic plaques or benign tumors will grow quickly and then stop when the cells on the outer surface senesce; with fully grown but relatively young plaques or tumors, the cells at the center should be able to divide in tissue culture, but those on the outside should not; the number of divisions which the center cells can undergo should correlate with the size of the plaque or tumor; and the median final size of a plaque or tumor should be correlated with the age of the person at the time the cells were released into the blood stream. (22 references)

4232 CHEMICAL INDUCTION OF CANCER: STRUCTURAL BASES AND BIOLOGICAL MECHANISMS, VOL. IIB.

(E.) Arcos, J. C. (Tulane Univ. Sch. Med., New Orleans, La.) and M. F. Argus. New York, Academic Press, 1974, 349 pp. (112 references)

NUTRITION AND CANCER. *(E.)* Krumdieck,
C. L. (Med. Cent., Univ. Alabama, Birming-
a J Med Sci 11(2):153-157, 1974. (59 ref-

THE POSSIBLE LEUKEMOGENIC ACTIVITY OF CHEM-
ICALS USED IN INDUSTRY. *(It.)* Pollini, G.
cup. Med., Univ. Pavia, Italy) and G. P.
Med Lav 64(3/4):121-126, 1973. (23 ref-

MORE FACTS ON VINYL CHLORIDE AND CANCER.
(E.) Anonymous. *Br Med J* 4(5943):486-487,
3 references)

NATURE OF HORMONAL INFLUENCE IN CARCINO-
GENESIS: STUDIES *IN VIVO* AND *IN VITRO*.
, T. L. (Dep. Breast Surg., Roswell Park
., Buffalo, N. Y.). *Biochem Dis* 4(Part B):
1974. (21 references)

BASIC MECHANISMS IN POLYCYCLIC HYDROCARBON
CARCINOGENESIS. *(E.)* Ts'o, P. O. P. (Dep.
Biophys. Sci., Johns Hopkins Univ., Balti-
), W. J. Caspary, B. I. Cohen, J. C. Leavitt,
sko, Jr., R. J. Lorentzen and L. M. Schecht-
ochem Dis 4(Part A):113-147, 1974. (54 ref-

CARCINOGENICITY AND STRUCTURE IN POLYCYCLIC
HYDROCARBONS. *(E.)* Jones, D. W. (Sch.
iiv. Bradford, England). *Prog Med Chem* 10:
1974. (210 references)

FORMATION AND REACTIONS OF EPOXY DERIVA-
TIVES OF AROMATIC POLYCYCLIC HYDROCARBONS.
ns, P. (R. Cancer Hosp., London, England)
Grover. *Biochem Dis* 4(Part A):237-247,
1 references)

FACTORS INFLUENCING BENZO(a)PYRENE METABO-
LISM IN ANIMALS AND MAN. *(E.)* Conney, A.
Biochem. Drug Metab., Hoffman-LaRoche Inc.,
. J.). *Biochem Dis* 4(Part A):353-374, 1974.
rences)

EFFECTS OF TOBACCO SMOKE ON BIOLOGICAL SYS-
TEMS. *(E.)* Kilburn, K. H. (No affilia-
Scand J Respir Dis [*Suppl*] (91):63-78, 1974.
erences)

VIRUSES AND GENITAL ONCOGENESIS. *(Sp.)*
Botella Llusia, J. (No affiliation). *An R*
Med (Madr) 91(1):63-67, 1974. (29 refer-

MATURATION OF EXTRACELLULAR ROUS SARCOMA
VIRUS. *(Rus.)* Anonymous. *Vopr Virusol*
765, 1973. (No references)

4244 TUMOR IMMUNOLOGY IN THE ELDERLY. *(Ger.)* Vorlaender, K. O. (Immunol. Lab., Berlin, Germany). *Z Gerontol* 7(1):60-74, 1974. (41 references)

4245 MECHANISMS OF IMMUNOLOGICAL ENHANCEMENT. *(E.)* Cruse, J. M. (Dep. Biol., Univ. Mississippi Grad. Sch., University), G. K. Lewis, H. D. Whitten, E. S. Watson, J. F. Fields, S. T. Adams, Jr., G. F. Harvey III, J. W. Paslay and M. Porter. *Prog Exp Tumor Res* 19:110-156, 1974. (193 references)

4246 MALIGNANT MELANOMA. *(E.)* Nairn, R. C. (Med. Sch., Monash Univ., Victoria, Australia). In: *Immunological Aspects of Skin Diseases* edited by L. Fry and P. P. Seah. New York, John Wiley & Sons, 1974, pp. 153-191. (123 references)

4247 IMMUNOLOGY AND IMMUNE REACTIONS IN MALIGNANT LYMPHOMA. *(E.)* Flad, H. D. (No affiliation). *Recent Results Cancer Res* 46:48-54, 1974. (24 references)

4248 IMMUNOLOGICAL ASPECTS OF THE ETIOLOGY OF HUMAN LEUKEMIA. *(E.)* Penny, R. (Dep. Med., Univ. New South Wales, Sydney, Australia). *Ser Haematol* 7(2):274-299, 1974. (136 references)

4249 PREINVASIVE CARCINOMA. *(E.)* Hamperl, H. (No affiliation). *Recent Results Cancer Res* 44:53-56, 1974. (9 references)

4250 THE ENIGMA OF HODGKIN'S DISEASE. *(It.)* Baserga, A. (Med. Clin., Univ. Ferrara, Italy). *Recent Prog Med (Roma)* 55(4):267-277, 1973. (25 references)

4251 CYTOGENETICS OF HODGKIN'S DISEASE. *(It.)* Castoldi, G. (Gen. Med. Clin., Univ. Ferrara, Italy). *Recent Prog Med (Roma)* 55(4):278-287, 1973. (41 references)

4252 RELATIONS BETWEEN SJOGREN'S SYNDROME AND MALIGNANT LYMPHOMAS. *(Sp.)* Perez Pena, F. (Fac. Med., Complutense Univ., Madrid, Spain), A. Arauzo Gonzalez and I. Candel Monserrate. *Rev Clin Esp* 133(6):465-470, 1974. (14 references)

4253 TROPHOBLASTIC DISEASE. *(Rus.)* Zhmakin, K. N. (No affiliation). *Akush Ginekol (Mosk)* (4):13-16, 1974. (No references)

4254 SOME METHODOLOGICAL PROBLEMS IN APPROACHING STUDY OF GLIOMA BIOLOGY. *(Rus.)* Arkhangelskii, V. V. (N. N. Burdenko Res. Inst. Neurosurg., Moscow, USSR). *Vopr Neirokhir* (3):50-56, 1974. (26 references)

4255 PEPTIC ULCER AND CANCER OF THE STOMACH. *(It.)* Anonymous. *Policlinico Sez Prat* 81(4):152-157, 1974. (No references)

4256 PSEUDOMALIGNANT DISORDERS: A REVIEW. *(E.)* Marcus, P. B. (Stellenbosch Univ. Med. Sch., Tierylei, South Africa). *J Surg Oncol* 6(6):531-547, 1974. (73 references)

4257 COMPARATIVE ASPECTS OF MAMMARY TUMORS. *(E.)* Hamilton, J. M. (Sch. Med., Leeds, England). *Adv Cancer Res* 19:1-45, 1974. (316 references)

4258 FIBROCYSTIC MASTOPATHY -- A PRECANCEROUS LESION? *(It.)* Anonymous. *Policlinico Sez Prat* 81(1):14-16, 1974. (No references)

4259 PRELEUKEMIA. *(It.)* Anonymous. *Policlinico Sez Prat* 81(6):224-228, 1974. (No references)

4260 MECHANISMS UNDERLYING TUMOR TRANSFORMATION AND TUMOR REVERSAL IN CROWN-GALL, A NEOPLASTIC DISEASE AT HIGHER PLANTS. *(E.)* Meins, Jr., F. (Dep. Biol., Princeton Univ., N.J.). In: *Developmental Aspects of Carcinogenesis and Immunity* edited by T. J. King. New York, Academic Press Inc., 1974, pp. 23-39. (57 references)

4261 THE INTERACTIONS OF LECTINS WITH ANIMAL CELL SURFACES. *(E.)* Nicolson, G. L. (Salk Inst. Biol. Stud., San Diego, Calif.). *Int Rev Cytol* 39:89-190, 1974. (677 references)

4262 OBSERVATIONS ON THE MOBILITY OF PROTEIN COMPONENTS OF THE PLASMA MEMBRANE. *(E.)* Edidin, M. (Dep. Biol., Johns Hopkins Univ., Baltimore, Md.). In: *Developmental Aspects of Carcinogenesis and Immunity* edited by T. J. King. New York, Academic Press, Inc., 1974, pp. 91-104. (26 references)

4263 SECOND MESSENGER SYSTEM IN NEOPLASIA. *(E.)* Criss, W. E. (Univ. Florida Coll. Med., Gainesville). *Oncology* 30(1):43-80, 1974. (360 references)

4264 ALPHA-FETOPROTEIN IN PRIMARY LIVER CANCER AND OTHER DISEASES. *(E.)* Kew, M. (Johannesburg Gen. Hosp., South Africa). *Gut* 15(10):814-821, 1974. (85 references)

4265 TUMORS IN CONTROL MICE: LITERATURE TABULATION. *(E.)* Sher, S. P. (Merck Sharp Dohme Res. Lab., West Point, Pa.). *Toxicol Appl Pharmacol* 30(3):337-359, 1974. (70 references)

:66 CHROMOSOME BANDS INDUCED IN HUMAN SYRIAN HAMSTER CELLS BY CHEMICAL CARCINOGENS. *(E.)*
iPaolo, J. A. (Natl. Cancer Inst., Bethesda, Md.)
nd N. C. Popescu. *Br J Cancer* 30(2):103-108, 1974.

fter 24 hr of treatment of human peripheral leucocyte
ıltures or Syrian hamster embryonic secondary cul-
ures with some known chemical carcinogens (7,12-di-
ethylbenz(*a*)anthracene, benzo(*a*)pyrene, aflatoxin B$_1$,
-acetoxy-2-fluorenylacetamide, *N*-methyl-*N*'-nitro-*N*-
itrosoguanidine, 4-nitroquinoline-1-oxide and ethyl-
arbamate) at concentrations that produce transfor-
ation *in vitro* of hamster cells, the chromosomes of
oth types of cells exhibited typical G banding.
hromosome bands did not result with urethane, a
ompound which does not produce cytotoxicity or cause
ransformation by direct exposure of cells. Noncar-
inogenic chemicals which do not inhibit cell multi-
lication also failed to produce bands. Cytogenetic
nalysis following removal of the carcinogens from
he cultures indicated non-banded, uniformly stained
hromosomes. Since the chromosome bands obtained
ısing the chemical carcinogens were similar to those
reviously obtained using noncarcinogenic compounds
hydroxyurea and azure B) and since metaphases with
hromosome crossbands were not observed with the
arcinogen urethane, the results reported here were
robably the result of nonspecific toxicity and
vere not related to the carcinogenic properties of
he chemicals.

267 CELL CYCLE DEPENDENCE OF CHEMICALLY INDUCED MALIGNANT TRANSFORMATION *IN VITRO*. *(E.)*
Marquardt, H. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.). *Cancer Res* 34(7):1612-1615, 1974.

To determine whether chemically induced malignant transformation in tissue culture was dependent on the cell cycle, a cloned line (m2) of mouse fibroblasts (susceptible to chemical transformation) was synchronized by a double thymidine block. The two transforming agents used were 7,12-dimethyl-benz(a)anthracene-5,6-oxide (DMBA-5,6-oxide) and *N*-methyl-*N*'-nitro-*N*-nitrosoguanidine (MNNG). The synchronized cells were treated for 30 min with the transforming agents. No transformation occurred after treatment in the G$_2$ and M phase of the mitotic cycle, but malignant transformation did occur with both agents when cells were treated in the G$_1$ or S phase. The induction of malignant transformation was significantly greater in S phase cells. Toxicity caused by both agents was not dependent on the cell cycle.

4268 *IN VITRO* ENHANCEMENT OF HEPATIC MICROSOMAL BIPHENYL 2-HYDROXYLATION BY CARCINOGENS. *(E.)* McPherson, F. (Dep. Biochem., Univ. Surrey, Guildford, England), J. W. Bridges and D. V. Parke. *Nature* 252(5483):488-489, 1974.

The effects of several chemically dissimilar carcinogens on biphenyl 2-hydroxylation and biphenyl 4-hydroxylation in rat liver microsomes were studied. Test compounds (carcinogens and noncarcinogens), and biphenyl were added to hepatic microsomes. The 2- and 4-hydroxybiphenyls formed were extracted and determined fluorimetrically. Preincubation of rat microsomes with a wide range of carcinogens such as 3,4-benz(a)pyrene, aflatoxin B$_1$, 2-acetamidofluorene, and dimethylnitrosamine in the presence of NADPH caused a significant enhancement of biphenyl 2-hydroxylation, while noncarcinogenic compounds, such as salicylate, phenobarbital and 1,2,3,4-dibenz-(a)pyrene, produced no significant effect on the biphenyl 2-hydroxylase. Neither class of compound produced any significant changes in biphenyl 4-hydroxylation. The enhancement of biphenyl 2-hydroxylation was not solely confined to hepatocarcinogens. Evidence that these carcinogens require metabolism before producing their effects was obtained by examining the cofactor requirements and the incubation time dependency of the increased biphenyl 2-hydroxylase activity. The carcinogens may have modified the membranes of the endoplasmic reticulum to cause the increased biphenyl activity. The results indicate that the *in vitro* enhancement of biphenyl 2-hydroxylase in hepatic microsomes in the presence of a NADPH-regenerating system may prove a basis for a preliminary screening system to detect potential carcinogens.

4269 CARCINOGENESIS BY CANCER CHEMOTHERAPEUTIC AGENTS: SECOND MALIGNANCIES COMPLICATING HODGKIN'S DISEASE IN REMISSION. *(E.)* Canellos, G. P. (Med. Branch, Natl. Cancer Inst., Bethesda, Md.), V. T. DeVita, J. C. Arseneau and R. C. Johnson. *Recent Results Cancer Res* 49:108-114, 1974.

The incidence of second malignancies caused by cancer chemotherapeutic agents in 438 cases of Hodgkin's disease in remission is described. The 438 cases were divided into subgroups according to the type of treatment received. The intensive chemotherapy group had received at least six monthly cycles of combination chemotherapy (mustargen-oncovin-prednisone-procarbazine [MOPP]) and the intensive radiotherapy group received at least 3000 r in a unified course of treatment. Some patients received both types of therapy. Fourteen second tumors were noted in the 438 patients and those patients who received intensive chemotherapy plus intensive radiotherapy had a 10.4% second cancer incidence compared to 2.3% in the remaining sub-groups. All the tumors seen were highly malignant and fatal, including two cases of acute myeloid leukemia. Thus, patients with Hodgkin's disease have a higher incidence of second tumors than the general population and patients receiving both types of therapy have a considerably higher risk than all the others. Three factors may be involved in this oncogenic mechanism: impairment of cellular immunity characterized by advanced Hodgkin's disease; immunosuppressive effects of radiation and chemotherapy; and the direct cellular effects of treatments on genetic structures of cells.

4270 A STUDY OF TOBACCO CARCINOGENESIS. XII. EPITHELIAL CHANGES INDUCED IN THE UPPER RESPIRATORY TRACTS OF SYRIAN GOLDEN HAMSTERS BY CIGARETTE SMOKE. *(E.)* Kobayashi, N. (Am. Health Found., New York, N.Y.), D. Hoffmann and E. L. Wynder. *J Natl Cancer Inst* 53(4):1085-1089, 1974.

The development of upper respiratory tract neoplasia in Syrian golden hamsters exposed to the carcinogen, 7,12-dimethylbenz(a)anthracene (DMBA), before cigarette smoke inhalation was studied using the Hamburg II inhalation device which provided 68 mg dry particulate matter/liter, and 4.1 mg nicotine/liter. Four groups (25 male hamsters each) were treated as follows: Group I was exposed to cigarette smoke after intratracheal instillation of 2 mg of DMBA; Group II was exposed to smoke only (no DMBA); Group III received only DMBA; and Group IV were controls and only received the vehicle (0.2 ml of 0.5% carboxymethyl cellulose-isotonic saline solution). Hyperplastic and neoplastic lesions, mainly leukoplakic changes, developed in the upper respiratory tracts (especially the larynx) of those that received DMBA plus the smoke, in a significantly higher incidence and earlier than in those that received no DMBA before exposure to the smoke. Other lesions that occurred in the first group (DMBA + smoke exposure) included squamous cell metaplasia of the nasal cavity, squamous cell papilloma of the oral cavity, and pharyngeal keratotic papillomas. The results demonstrated tumor-promoting and/or cocarcinogenic activity of cigarette smoke to the hamsters' upper respiratory tracts.

4271 FUNCTIONAL AND BIOCHEMICAL EFFECTS ON THE LUNG FOLLOWING INHALATION OF CIGARETTE SMOKE AND CONSTITUENTS. 1. HIGH- AND LOW-NICOTINE CIGARETTES IN MICE.

(E.) Aviado, D. M. (Sch. Med., Univ. Pennsylvania, Philadelphia) and T. Watanabe. *Toxicol Appl Pharmacol* 30(2):185-200, 1974.

Functional and biochemical effects on the lung following inhalation of filtered and non-filtered smoke from high- and low-nicotine cigarettes in 135 male Swiss and ICR mice were studied. The Walton horizontal smoke-exposure machine was used to expose the mice to smoke from two lighted cigarettes for 15 sec/min for a total of 8 min twice daily for either 5 or 10 weeks. Inhalation of smoke caused increased pulmonary resistance in both strains, but sensitivity differed between strains. The Swiss strain was unaltered by 5 weeks of exposure to low-nicotine (0.31%) cigarette smoke but showed increased pulmonary resistance to high-nicotine (2.09%) smoke, while the pulmonary resistance of ICR strain (higher than that of the other strain in the controls) was elevated by exposure to low-nicotine smoke. Both strains developed a tolerance to bronchospasm after 10 weeks. While nicotine played an important role in the increased pulmonary resistance, it was not the exclusive cause, as shown by an increase in resistance from the vapor phase of the smoke (which did not include nicotine). The reduction in pulmonary compliance was associated with the inhalation of filtered high-nicotine cigarette smoke for both 5 and 10 weeks, and no tolerance was developed. High-nicotine content smoke caused a fall in functional residual capacity, irrespective of whether the smoke had been filtered. There was no functional sign of emphysema in the mice after 10 weeks of exposure. The ICR strain had a reduced tidal volume following exposure to low-nicotine smoke for 5 weeks, while 10 weeks of exposure to high-nicotine smoke was required before the Swiss strain showed this effect. There was no reduction of phospholipid content of the lung, and there was an increase in the wet weight of the lung relative to body weight, which was reduced. The results indicate that nicotine is involved in the production of pulmonary resistance and the reduction in residual functional capacity, pulmonary compliance, and tidal volume.

4272 2-ACETYLAMINOFLUORENE AND *N*-HYDROXY-2-ACETYLAMINOFLUORENE INHIBITION OF INCORPORATION OF OROTIC ACID-5-^{3}H INTO NUCLEAR RIBOSOMAL AND HETEROGENEOUS RNA IN NORMAL AND REGENERATING LIVER.

(E.) Glazer, R. I. (Dep. Pharmacol., Emory Univ., Atlanta, Ga.), R. C. Nutter, L. E. Glass and F. M. Menger. *Cancer Res* 34(10):2451-2458, 1974.

The effects of 2-acetylaminofluorene (AAF) and N-hydroxy-2-acetylaminofluorene (N-OH-AAF) were studied on incorporation of orotic acid-5-^{3}H into nuclear ribosomal RNA (rRNA) and heterogeneous RNA (HnRNA) of normal and regenerating Sprague-Dawley rat liver. Animals were exposed to AAF or N-OH-AAF (1-40 mg/kg, i.p.) for 2 hr and received an i.p. injection of ^{3}H-orotic acid 15 min before sacrifice. Dose response studied on partially hepatectomized rats showed that N-OH-AAF was about 8 times more effective than the parent compound, AAF, in inhibiting incorporation of label into rRNA and HnRNA (40% with 40 mg/kg AAF *vs* 40% with 5 mg/kg N-OH-AAF); 7-hydroxy-2-acetylaminofluorene (40 mg/kg) did not significantly inhibit incorporation into either RNA species. Partially hepatectomized females were 2-3 times less sensitive than males. ^{3}H-Orotic acid incorporation into rRNA and HnRNA of sham-operated controls was unaffected by AAF but was inhibited by N-OH-AAF to an extent which was somewhat less than that in N-OH-AAF-treated partially hepatectomized rats. The N-OH-AAF induced inhibition of nuclear RNA synthesis was accompanied by a concomitant reduction in rRNA and messenger RNA associated with free and membrane-bound polyribosomes. Examination of the uridine triphosphate (UTP) pool specific activity of N-OH-AAF-treated, partially hepatectomized rats showed no change after 1 or 4 hr although there was a 55% increase in hepatic UTP concentration at these times. Pretreatment with phenobarbital or 3-methylcholanthrene had no effect on AAF-induced inhibition of nuclear RNA labeling. Disc gel electrophoretic analysis of RNA from N-OH-AAF-treated rats showed results consistent with an inhibition of rRNA transcription (i.e., decreased 45S precursor) rather than an effect on maturation. Decreased inhibition of incorporation of label into 24S and 28S HnRNA was also consistent with an inhibition of N-OH-AAF of RNA polymerase activity.

4273 CYCLIC AMP METABOLISM IN RAT LIVER DURING 2-ACETYLAMINOFLUORENE CARCINOGENESIS.

(E.) Christoffersen, T. (Inst. Pharmacol., Univ. Oslo, Norway), G. O. Brønstad, P. Walstad and I. Øye. *Biochim Biophys Acta* 372(2):291-303, 1974.

Adenylate cyclase activity, cyclic AMP phosphodiesterase activity and cyclic AMP were determined in liver of 2-acetylaminofluorene (AAF)-fed male Wistar rats with or without incubation with adrenalin, isoprenalin or glucagon. Serum levels of corticosteroids, insulin and glucose were also studied. The

ber of rats for each determination varied from
. The liver from rats on a diet containing 0.025%
for four weeks showed moderately increased basal
nylate cyclase activity and markedly increased
nylate cyclase activity in response to adrenalin
the incubation fluid as compared to liver from
trol animals. AAF treatment did not alter adenyl-
cyclase activity in response to glucagon. Feeding
0.025% AAF for 4-8 weeks did not significantly change
lic AMP phosphodiesterase activity in the liver.
lic AMP in preincubated liver slices was measured
pM/mg (wet weight). After incubation in 2 mM
ophylline for two min, pM cyclic AMP were 0.43
al, 0.61 after adrenalin, 0.42 after isoprenalin
1.98 after glucagon. In controls fed ad libitum;
3 basic, 0.21 after adrenalin and 0.37 after iso-
nalin in one pair-fed control; 0.37 basic, 2.87
er adrenalin and 5.43 after isoprenalin in rats
a 0.025% AAF diet for seven weeks; and 0.33 basic,
7 after adrenalin and 2.07 after glucagon in rats
a 0.05% AAF diet for seven weeks. Cyclic AMP lev-
in fresh liver after different durations of 0.025%
feeding up to eight weeks were determined. Dur-
the first four weeks of treatment cyclic AMP did
differ from controls, then rose steadily (75%
er initial values). Incubated liver slices from
s after different durations of 0.025% AAF feeding
to seven weeks) showed a steady increase in re-
onsiveness of cyclic AMP levels to adrenalin. Dis-
ntinuation of the diet after three weeks caused
crease in response to adrenalin (control level af-
two weeks). At various points between one and
ven weeks on 0.025 AAF diet total corticosteroids
serum decreased by 30%, insulin decreased by 25%
d glucose decreased by 23%. The study was limited
stages prior to the appearance of tumors. The
lationship of the studied changes in cyclic AMP
tabolism to the carcinogenic process is not clear.

74 A MODEL FOR CARCINOMA OF THE KIDNEY IN BUF-
FALO STRAIN RATS INGESTING N-4-(4'-FLUORO-
PHENYL)ACETAMIDE. *(E.)* Reuber, M. D. (Natl. Cancer
st., Bethesda, Md.). *Gann* 65(5):389-394, 1974.

animal model for studies concerning carcinogenesis
the kidney is described. Twelve-week-old male and
male Buffalo rats were maintained for 36 weeks on
diet containing 0.04% N-4-(4'-fluorobiphenyl)aceta-
de (4'F-4-BAA). Thereafter, the animals were kept
r an additional 12 weeks on the basal diet without
rcinogen. The rats initially lost weight on the
rcinogen diet, but gained it back by the 20th week.
ven of the 14 males and two of the 15 females de-
loped carcinomas of the kidney; no renal carcino-
s were observed in several hundred control rats of
e same strain. The carcinomas varied in size from
8-2.4 cm, the larger ones generally being found in
e upper pole of either kidney. There was exten-
ve coagulation or liquifaction necrosis in all
rcinomas, the necrotic cells being filled with
pid. The tumor cells had large nuclei and scanty
sophilic cytoplasm. The carcinomas did not invade
e renal vein or organs adjacent to the kidney, nor
d they metastasize to lymph nodes, lungs, or other
gans. The kidneys containing carcinomas also had
umerous cysts, the larger ones being filled with
fluid. Hydronephrosis was usually present to some degree. On transplantation, the renal carcinomas grew and eventually killed the host animals; they resembled the primary carcinomas histologically. Although six of 14 male rats developed liver tumors, such tumors were either absent or small in size in the animals which developed renal carcinomas. This model will be useful for studying renal carcinogenesis in that the carcinomas were well-differentiated, resembled renal cell carcinomas in humans, and were easily followed through the changes leading from hyperplasia to hyperplastic nodules to carcinomas.

4275 CARCINOGENESIS IN EXTRAHEPATIC BILE DUCT AND GALLBLADDER - CARCINOGENIC EFFECT OF N-HYDROXY-2-ACETAMIDOFLUORENE IN MICE FED A "GALLSTONE-INDUCING" DIET. *(E.)* Enomoto, M. (St. Marianna U. Sch. Med., Kawasaki, Japan), S. Naoe, M. Harada, K. Miyata, M. Saito and Y. Noguchi. *Japan J Exp Med* 44(1):37-54, 1974.

Inbred strain DDD female mice received a diet containing 1.0% "cholesterin" plus 0.5% cholic acid (gallstone-inducing diet, C-CA), with or without 0.05% 2-acetamidofluorene (AAF) for 18 wk or 0.05% of its N-hydroxy derivative (N-OH-AAF) for 30 wk. Other groups of mice were given AAF or N-OH-AAF alone, for the same period, respectively. The gallbladder and extrahepatic bile duct of the mice fed C-CA diet for over 18 wk revealed the marked proliferative and inflammatory changes associated with deposits of stone-like substance. The addition of N-OH-AAF to the C-CA diet seemed to accelerate the proliferative changes. In mice fed N-OH-AAF with or without C-CA diet many tumors and hyperplastic lesions were induced in the urinary bladder, esophagus, forestomach and liver. The mice fed AAF, however, showed no remarkable changes at sacrifice of 34 wk after the start of the experiment.

4276 AFLATOXIN B_1-2,3-OXIDE: EVIDENCE FOR ITS FORMATION IN RAT LIVER *IN VIVO* AND BY HUMAN LIVER MICROSOMES *IN VITRO*. *(E.)* Swenson, D. H. (U. Wisconsin Med. Ctr., Madison), E. C. Miller and J. A. Miller. *Biochem Biophys Res Commun* 60(3): 1036-1043, 1974.

Four male Fischer rats were injected i.p. with ^{3}H-aflatoxin B_1 (AFB_1) (72 μg) in dimethylsulfoxide. In each case, the liver DNA, rRNA, and protein was isolated 14 hr later. Nine percent of the ^{3}H injected as ^{3}H-AFB_1 was recovered covalently bound to the liver macromolecules. The specific activities of the DNA and rRNA were 15 and 20 times, resp., those of the protein. Mild hydrolysis of the DNA and rRNA adducts yielded a product indistinguishable from 2,3-dihydro-2,3-dihydroxy-aflatoxin B_1. The data indicate that approximately 60% of the nucleic acid adducts were derived from *in vivo* reactions between the metabolically generated electrophile AFB_1-2,3-oxide and nucleophilic nitrogen and oxygen atoms in the DNA and rRNA. The acid hydrolysis of rRNA-^{3}H-AFB_1 adduct formed by human liver microsomes (obtained from a 48-yr-old female suspected of having Hodgkin's disease) *in vitro* also liberated the dihydrodiol in significant quantities. The 2,3-

oxide of AFB_1 is a probable ultimate carcinogenic metabolite.

4277 ENHANCEMENT OF THE ACTIVITY OF BEEF MUSCLE LACTATE DEHYDROGENASE BY AFLATOXIN B_1 *IN VITRO*. *(E.)*

Lu, F. J. (Coll. Med., Natl. Taiwan Univ., Taipei), H. Y. Chiou, C. Y. Hsu and K. H. Ling. *J Formosan Med Assoc* 73(1):16-21, 1974.

The effect of aflatoxin B_1 on the activity of beef muscle lactate dehydrogenase (LDH) was studied *in vitro*. LDH was incubated with aflatoxin B_1 purified from *Aspergillus flavus*. In a complete system consisting of pyruvate, LDH, and NADH, the activity of LDH was activated by the addition of aflatoxin B_1; the degree of enhancement was dependent on the molar ratio of enzyme to aflatoxin, maximum enhancement being obtained at a ratio of 4:1. When no substrate (pyruvate) was present in the system, there was no enzymic activity either in the presence or absence of aflatoxin. As shown by elution on a Sephadex G-100 column, aflatoxin B_1 was not firmly bound to LDH after one hr of incubation. The absorption spectrum of LDH-aflatoxin B_1 was changed by the presence of pyruvate in the incubation medium. The results suggest that the mechanism of interaction between aflatoxin B_1 and LDH is different *in vitro* and *in vivo*.

4278 COMPARATIVE METABOLIC CONVERSION OF AFLATOXIN B_1 TO M_1 AND Q_1 BY MONKEY, RAT AND CHICKEN LIVER. *(E.)*

Masri, M. S. (West. Regional Res. Lab., Agr. Res. Serv., Berkeley, Calif.), A. N. Booth and D. P. H. Hsieh. *Life Sci* 15(2):203-212, 1974.

The *in vitro* metabolism of aflatoxin B_1 by liver microsomal preparations from monkey (three species), rat, and chicken was studied. With all species, both the previously recognized metabolite aflatoxin M_1 and the newly identified aflatoxin Q_1 were produced from the aflatoxin B_1 substrate. Aflatoxin Q_1 is an isomer of aflatoxin M_1 with the hydroxyl on the carbon β to the carbonyl of the cyclopentenone ring. It was recently discovered following the incubation of rat and monkey liver preparations with aflatoxin B_1. These incubations did not produce detectable aflatoxin P_1, which has been reported as a major metabolite of aflatoxin B_1 in living monkeys. In general, the conversion to aflatoxin M_1 was comparable among the different species (1-3% of the substrate), except in the chicken in which it was lower (0.0-0.3%) The conversion to Q_1 was comparable to or slightly higher than the conversion to M_1 in the rat and chicken liver preparations, but the conversion of Q_1 in the monkey liver preparations was significantly higher, accounting for 19-52% of the substrate in three species of monkeys tested.

4279 HAZARDS PRESENTED BY MYCOTOXINS AND TOXIGENIC-MOLD SPORES IN FEEDS. *(E.)*

Cardeilhac, P. T. (Dep. Vet. Sci., Univ. Florida, Gainesville) and K. P. C. Nair. *Toxicol Appl Pharmacol* 30(2):299-308, 1974.

The potential hazards of mycotoxins and toxigenic-mold spores in feeds was studied. The prevalence of these was estimated using a chloroform extraction technique and detection of the toxin in the extract by bioassay for cytotoxicity. Thin-layer chromatography was used to indicate the presence of aflatoxins. During one calendar year, 997 feeds were tested. Mycotoxins were obtained as either a feed lipid fraction by chloroform extraction, or a mold lipid fraction by chloroform extraction of Czapek-Dox broth after a seven day culture of mold spores present in t feed. Cytotoxicity was determined by using chick tracheal ring organ cultures. A feed sample was suspected of containing mycotoxins when both feed and mold lipids were cytotoxic; and samples were considered to contain toxigenic-mold spores when the mold lipids were cytotoxic. Aflatoxin was considered present when feed lipids were cytotoxic and contained material with fluorescent and chromatographic properties similar to the aflatoxin standard. Feed lipids comprised 1.1-3.0% of the wet weight of the samples and were assayed by suspending the lipid from 0.10 g of feed in 1.0 ml of culture medium, producing a mean lipid concentration of 1917 μg/ml. A 100% cytotoxic response was given in 16% of the lipid samples from nine basic feed types. Based on results from calculated dose-response curves, cytotoxic mold lipids which did not contain aflatoxin were more than 30 times as toxic as feed lipids, and mold lipids which contained aflatoxin were more than 300 times as toxic as feed lipids. Mycotoxin contamination was suspected in 5.7% of 749 samples with over half of the suspect samples containing aflatoxin, but this was less than 200 parts per billion. These results confirm aflatoxin as the most hazardous of the mycotoxins, although a period of storage under conditions favorable for mold growth would be necessary before contaminated feeds would present any acute hazard to livestock. The results also indicate that molds presently not considered highly toxigenic often produce toxic products and remove readily accessible required nutrients from the feed.

4280 ONCOGENICITY OF γ-[1-METHYL-5- *bis*-(β-CHLOROETHYL) AMINOBENZIMIDAZOLYL-(2)]-BUTYRIC ACID HYDROCHLORIDE (CYTOSTASAN) IN MICE. *(Ger.)*

Guttner, J. (Cent. Inst. Microbiol. Exp. Ther., Jena, Germany), G. Bruns and W. Jungstand. *Arch Geschwulstforsch* 43(1):16-21, 1974.

The carcinogenic effect of i.p. and p.o. administered Cytostasan was studied in 9-wk-old female conventional AB/Jena inbred mice. Repeated i.p. injections of Cytostasan (4 x 12.5 mg/kg and 25 mg/kg resp.) on four consecutive days caused serious chronic fibroplastic peritonitis, intraperitoneal fibrosarcomas, and a significant shortening of the survival time. The minimum latent period for fibrosarcomas was 19 wk. The absolute number and the incidence of multiple pulmonary adenomas were low. A marked increase in the incidence of pulmonary adenoma of all types with pronounced malignant transformation in 12 cases, as well as pleural and mediastinal lymph node metastases, were observed following p.o. administration of 4 x 62.5 mg/kg Cytostasan on 4 consecutive days. Reduction of the induction time, and 6 ases of mammary gland carcinomas, which otherwise do ot occur spontaneously in these animals, were also oserved. The incidence of reticulum-cell sarcoma and ubcutaneous fibrosarcoma did not differ significantly rom that found in controls, while the incidence of ther tumors (gastric papilloma, uterine leiomyoma and ibroma and lymphosarcoma) was within the normal range. ne findings indicate Cytostasan is an organotropic arcinogen.

281 CARCINOGENESIS IN TISSUE CULTURE 22. MALIGNANT TRANSFORMATION OF CLONED RAT LIVER ELLS TREATED IN CULTURE WITH 4-DIMETHYLAMINOAZOBEN- ENE AND PROPERTIES OF THE TRANSFORMED CELLS.

(E.) iyahara, Y. (Okayama Univ. Med. Sch., Japan), M. Nam- a and J. Sato. *Acta Med Okayama* 28(2):99-109, 1974.

ultured rat liver cells (PC-2) which were cloned from single cell (RLN-E7 cell line) were transformed into alignant cells by a chemical carcinogen, 4-dimethyl- minoazobenzene (DAB). A concentration of 5 or 20 g/ml of DAB was used and the cells were treated con- inuously. The DAB-transformed cells produced tumors hen back-transplanted into new-born rats but the car- inogen-untreated control cells did not. Character- stics of the transformed liver cells were compared o those of DAB-untreated control cells with regard to he morphology, the uptake of DAB from the cul- ure medium by the cells, the incorporation of ^{3}H- AB into the cells, and the aggregate-forming ability f the cells in roller culture. The results showed hat no significant parameter of malignant transfor- ation in culture was detectable except the tumori- enicity of the transformed cells upon the inocu- ation into animals.

282 A POSSIBLE MECHANISM ACCOUNTING FOR THE INCREASED RATE OF GLYCOLYSIS IN RAT LIVER URING CARCINOGENESIS.

(Rus.) Rubenchik, B. L. Kiev Inst. Nutr., USSR). *Biokhimiia* 39(4): 740- 46, 1974.

xperiments were run on male albino rats fed a diet f *p*-dimethyl-aminoazobenzene to study the correla- ion between the rate of glycolysis and the activities f phosphofructokinase (PFK), hexokinase (HK) and yruvate kinase at different stages of carcinogene- is. Enhanced glycolysis was accompanied by an in- reased activity of PFK and a change in its kinetic arameters: its affinity for allosteric effectors ATP and citrate) decreased, while its affinity for ructose-1,6-diphosphate increased. The activity of K in the liver increased only in the late stages of arcinogenesis after the rate of glycolysis had in- reased. At this time, the affinity of HK for ATP ad increased, and the inhibiting effect of ADP de- reased. On the basis of results from kinetic stud- es of model systems, which made it possible to fol- ow glycolysis and the activities of PFK, HK and py- uvate kinase simultaneously, together with the rate t which reaction products and intermediates were ynthesized, it is suggested that glycolysis may be egulated by a negative feedback mechanism during arcinogenesis.

4283 LIVER CIRRHOSIS AND HEPATOMA IN RATS INDUCED BY 3-BENZYLSYDNONE-4-ACETAMIDE.

(E.) Ohtsubo, K. (Inst. Med. Sci., Univ. Tokyo, Japan) and M. Saito. *Gann* 65(3):273-277, 1974.

The induction of malignant hepatoma associated with liver cirrhosis by 3-benzylsydnone-4-acetamide (I) was studied in 48 ten week old male Donryu rats. A suspension of the sydnone in 0.5% carboxymethylcellulose was administered *via* gastric tube six days/week at a dose of 0.5 or 1.0 ml/100 g. Controls received just carboxymethylcellulose. Average body weight of the treated rats was less than that of controls. Upon autopsy, lesions were confined to the liver. Subacute atrophy with submassive necrosis was the predominant lesion in rats that died early in the study or were killed after four weeks. Postnecrotic cirrhosis developed in 20/36 rats that received 23-47 g/kg of the sydnone during 8-16 weeks. Of those that survived the administration, 79.2% developed hepatomas (histologically diagnosed as hepatocellular carcinomas and adenomas) 126 to 251 days from the start of the study. Most of these also had liver cirrhosis. Incidence of cirrhosis and fibrosis corresponded with the total amount of the sydnone given; with higher levels, subacute atrophy and postnecrotic cirrhosis were frequent, while with the lower doses thin-septal cirrhosis and fibrosis were more common.

4284 LEUKEMIA IN SHOE-WORKERS EXPOSED CHRONICALLY TO BENZENE.

(E.) Aksoy, M. (Intern. Clin. Istanbul Med. Sch., Turkey), S. Erdem and G. DinCol. *Blood* 44(6):837-841, 1974.

The incidence of leukemia in workers involved in the shoe, slipper, and handbag industry (1967-1973) in which benzene was used as a solvent was studied in Turkey. During these seven yr, 26 patients with acute leukemia or preleukemia were observed among a group of 28,500 workers at risk (an incidence of 13/100,000). This incidence was significantly greater than that of 6/100,000 in the general population. The duration of exposure to benzene varied from 1-15 yr with a mean of 9.7 yr. The average age at time of diagnosis was 34.2 (range of 16-58). The most common morphologic type was acute myeloblastic leukemia (14/26). Some clinical features of the disease were described. The reported incidence of leukemia among workers chronically exposed to benzene was further proof of benzene's role in the etiology of leukemia.

4285 EVALUATION OF THE EFFECT OF DIANISIDINE PRODUCTION ON THE HEALTH OF WORKERS WITH REGARD TO ITS CARCINOGENIC RISK.

(Rus.) Genin, V. A. (Inst. Exp. Clin. Oncol., Moscow, USSR). *Gig Tr Prof Zabol* (6):18-22, 1974.

Some changes have been made in the process by which dianisidine is manufactured to reduce the risk of dye workers' developing bladder cancer. In this process, *o*-nitroanisole is reduced to hydrazoanisole, the reaction mixture is reduced with Zn dust, and Zn is separated and recovered from the slurry as ZnO instead of being discharged into the factory's waste water. Dianisidine, which had previously been manufactured as the hydrochloride, is now produced as the sulfate to eliminate the salting out step in which the operator was required to shovel NaCl into a reaction mixture containing dianisidine sulfate at 90 C for 2 hr. The temperature of the reaction mixture containing dianisidine sulfate has been reduced to 50 C to reduce the concentration of this carcinogen in the air. Washings from the hands of workers involved in the production of dianisidine by this new process (1972) were compared with similar data obtained with the older process (1947-1948). Concentrations of dianisidine were significantly lower with the new process. In 1947-1948, washings from the hands of workers involved in the reduction process contained 0.44-11.38 mg (mean 5.03 mg) of dianisidine, whereas those obtained with the new process contained 0.005-0.0125 mg (mean 0.0087 mg). For those involved in the filtration process, the corresponding values were 4.8-32.5 mg (mean 11.79 mg) with the old process and 0.0003-0.075 mg (mean 0.021 mg) with the new process. Since dianisidine and benzidine are produced in the same place, none of these workers has developed bladder cancer which can be attributed to dianisidine exposure alone. It is recommended that Zn dust be charged into the reducing mixture automatically and that the filtration apparatus be sealed and automated to reduce exposure of workers to dianisidine.

4286 ONCOGENIC ACTIVITY OF AN *m*-DIOXANE DERIVATIVE: 2,6-DIMETHYL-*m*-DIOXAN-4-OL ACETATE (DIMETHOXANE). *(E.)* Hoch-Ligeti, C. (VA Ctr., Martinsburg, West Va.), M. F. Argus and J. C. Arcos. *J Natl Cancer Inst* 53(3):791-794, 1974.

The oncogenic activity of 2,6-dimethyl-*m*-dioxan-4-ol acetate (DDOA) was studied in male Wistar rats given the agent *ad lib* as a 1% solution in the drinking water for 613 days. At the end of the experimental period, the animals had received an average of 237 g of DDOA. The chemical produced 14 tumors (8 liver, 1 kidney, 2 skin and subcutaneous tissue, 2 lymphosarcomas, 1 leukemia) in 25 rats. Four tumor-bearing and one nontumor-bearing rat died. The liver tumors were similar to those produced by nitrosamine derivatives, cycasin, or dioxane. Although lung tumors were not found, most of the rats had foci of purulent or granulomatous inflammation in the lung, probably due to chronic murine pneumonia. The mechanism responsible for the carcinogenecity of dioxanes is unknown, but their biologic activity is probably due to activated metabolite(s) of the ring as a whole.

4287 SHORT-TERM TOXICITY OF 2,3,7,8-TETRACHLORODIBENZO-*p*-DIOXIN IN THE RAT: MORPHOLOGICAL, ULTRASTRUCTURAL, AND ENZYMOLOGICAL STUDY OF THE LIVER. *(Fr.)* Truhaut, R. (Fac. Pharm. Biol. Sci., Rene Descartes Univ., Paris, France), Pham-Huu-Chanh, G. van Haverbeck, M. C. Azum-Gelade, G. Saint Ruf and L. Lareng. *C R Acad Sci* [*D*] *(Paris)* 279(18):1565-1569, 1974.

2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (Dioxin) was administered to albino Norwegian rats and Wistar A. G. rats: 50 rats received 50 μg/kg i.p. and 100 rats, 100 μg/kg p.o. five times/wk for 24 days. there were no deaths until 8 days after institution of treatment, but after 22 days the mortality had reached 80%. After 18 days the liver appeared grossly normal, but microscopic examination showed pseudoacinar structures formed from accumulation of hepatocytes around canaliculi or lacunae. Examination of sections from the lungs of two rats disclosed the presence of hepatic cells in the pulmonary parenchyma. Kinetic studies of hepatic lesions revealed that none were present until 7 days after Dioxin treatment was begun. They consisted of anisokaryosis, frequent binucleation, slight cellular retraction, cytoplasmic homogenization and vacuolation of some cells. These lesions became more pronounced after 9 days, but pseudoacinar structures were not observed until the 18th day or later. The first ultrastructural changes became evident after 7 days and consisted of dilatation of the endoplasmic reticulum which gave rise to small vacuoles; myelin figures were also present. The structure of mitochondria remained almost normal until the 24th day. No apparent change occurred in succinate dehydrogenase or diphosphopyridine nucleotide-tetrazolium reductase activities, while the activity of pericanalicular adenosine triphosphatase almost completely disappeared after 3 days. These findings suggest that Dioxin may be carcinogenic. However, no accumulations of hyperbasophilic cells, considered to be the first manifestation of malignant transformation, were ever found.

4288 THE EFFECT OF ETHIDIUM BROMIDE ON THE MEMBRANE GLYCOPEPTIDES IN CONTROL AND VIRUS-TRANSFORMED CELLS. *(E.)* Soslau, G. (Dep. Ther. Res., Univ. Pennsylvania Sch. Med., Philadelphia), J. P. Fuhrer, M. K. Nass and L. Warren. *J Biol Chem* 249 (10):3014-3020, 1974.

Glycopeptides were derived from surface and subcellular membranes of control (BHK_{21}/C_{13}) and virus-transformed (C_{13}/B_4) baby hamster kidney cells (treated or untreated with ethidium bromide). Treated cells were subjected to 2 μg of ethidium bromide/ml of growth medium for 24 hr prior to the addition of L-[^{3}H] fucose. Ethidium bromide mimicked virus transformation with regard to the alteration of the glycopeptide patterns observed with Sephadex G-50 chromatography. Elution profiles of glycopeptides of virus-transformed cells showed a normal component (Peak B) and an enrichment of material eluting as a higher molecular weight component (Peak A). Peak A material was greatly enhanced in both the control and virus-transformed cells after treatment with ethidium bromide. This alteration of the glycopeptide pattern was observed with glycopeptide derived from surface, endoplasmic reticular and mitochondrial membranes. Mitochondrial glycopeptides obtained from ethidium bromide-treated cells contained an increased amount of material eluting as a component of lower molecular weight than Peak B. This material, called Peak C, may be located in the intramembrane space of the mitochondrion. Ethidium bromide was responsible for changes in the carbohydrate component of the glyroteins of intracellular membranes, the plasma nbrane, and the inner and outer mitochondrial mem- anes. The mode of action has not been determined.

39 *IN VIVO* AND *IN VITRO* BINDING OF ETHIONINE WITH NUCLEIC ACIDS. *(E.)* Grilli, S. (Inst. col., Univ. Bologna, Italy), A. M. Ferreri, P. cchi and G. Prodi. *Gann* 65(6):507-511, 1974.

e interaction of ethionine with DNA and polynucleo- des was studied using adult male Wistar rats and beled compounds (L-ethionine[ethyl-1-^{14}C] and L- hionine[ethyl-1-^{3}H]). Rats, in groups of three re injected i.p. with ^{14}C-ethionine (326 μCi cor- sponding to 367 μM/kg) or ^{3}H-ethionine (4 mCi rresponding to 3.07 mM/kg or 500 mg/kg). Animals re killed 12 hr after the administration of the rcinogen and four fractions, DNA, rRNA, and nu- ear and cytoplasmic proteins, were extracted from e liver by the phenol method of Roberts and Warwick. A was incubated with microsomes and 10 μCi of C-ethionine or 34 μCi of ^{3}H-ethionine were added the medium. Polynucleotides were incubated with crosomes and 34 μCi of ^{3}H-ethionine were added. The dioactivity of the purified samples of DNA and poly- cleotides was measured in a liquid scintillation ectrometer. No *in vivo* binding of ethionine to A occurred at low doses of the carcinogen while scarce binding to DNA and an increased binding to NA and proteins were evident at high doses. The cubation *in vitro* of DNA with microsomes has own a definite binding of ethionine to DNA. *In tro* binding with polynucleotides showed all the lynucleotides were labeled but to a different ex- nt; the activity decreased with poly-A and poly- The *in vitro* binding of ethionine to DNA was crosome-dependent and higher in the presence of tivated microsomes and pH-5 enzymes.

90 ALTERATIONS OF LIVER ERGASTOPLASMIC MEM- BRANES DURING DL-ETHIONINE HEPATOCARCINO- NESIS. AMINOPYRINE DEMETHYLASE ACTIVITY AND RIBO- ME MEMBRANE INTERACTION. *(E.)* Gabriel, L. (Inst. n. Pathol., Univ. Torino, Italy), R. A. Canuto, Gravela, R. Garcea and F. Feo. *Life Sci* 15(2): 19-2125, 1974.

e activity of microsomal aminopyrine demethylase d the degree of association between ribosomes and doplasmic membranes were studied in the liver of le and female Wistar rats fed ethionine, and in hy- rplastic nodules and hepatomas. The treated rats re fed a basal diet supplemented with 0.25% DL- hionine for a maximum of five months, followed by 3 months of basal diet, while the controls were fed e basal diet. Ethionine caused the inhibition of inopyrine demethylase (40-48% of the control value) d an increase in the relative amounts of membrane- ee ribosomes in the liver cells. One to three nths after the ethionine feeding was stopped, and en hyperplastic nodules and hepatomas developed in e liver, there was a sharp inhibition of aminopy- ne demethylase in these areas, but not in the sur- unding non-nodular areas. At the same time an in- ease in membrane-free ribosomes occurred in surrounding non-nodular liver, in nodules and in hepatomas, but the alteration was lower in the surrounding non-nodular liver.

4291 UNSCHEDULED DNA SYNTHESIS IN THE GERM CELLS OF MALE MICE EXPOSED *IN VIVO* TO THE CHEMICAL MUTAGEN ETHYL METHANESULFONATE. *(E.)* Sega, G. A. (Oak Ridge Natl. Lab., Tenn.). *Proc Natl Acad Sci USA* 71(12):4955-4959, 1974.

The occurrence of unscheduled DNA synthesis, which was interpreted to represent repair, was studied after *in vivo* treatment with a 250 mg/kg dose of the alkylating agent, ethyl methanesulfonate (EMS). This synthesis occurred in meiotic and postmeiotic germ cell stages of (C3Hf x 101)F_1 male mice. Testicular injections of [methyl-^{3}H]thymidine (56 Ci/mM) were given to maximize DNA labeling. The germ cell stages showing unscheduled DNA synthesis ranged from early to middle meiotic prophase stages through early to middle spermatid stages. The initiation of this synthesis was rapid, beginning within one hr after the EMS i.p. injection. Unscheduled DNA synthesis did not occur in the most mature germ cell stages, which would give rise to dominant lethal mutations, nor did it occur in stages where protamine had replaced the chromosomal histones.

4292 SIGNIFICANCE OF CHEMICAL CARCINOGEN-INDUCED IMMUNOSUPPRESSION IN MAMMARY TUMORIGENESIS IN BALB/c MICE. *(E.)* Medina, D. E. (Baylor Coll. Med., Houston, Tex.), G. Stockman and D. Griswold. *Cancer Res* 34(10):2663-2668, 1974.

Cell-mediated and humoral immune status were evaluated in BALB/c mice between 1-100 days following intragastric instillation of a carcinogenic dose of 7, 12-dimethylbenz(a)anthracene (DMBA, 1.5-3.0 mg) or 2-methylcholanthrene (MCA 1.5 mg). Both carcinogens depressed cell-mediated rejection of skin and heart homografts from DBA/f mice (relatively weak histocompatibility barrier) for up to 50 days by a factor of 1.5 to 2. Cell-mediated immune response, however, returned to normal after 90 days. Humoral antibody response, as measured by the direct hemolysin plaque assay, was unchanged in MCA-treated mice up to 65 days after treatment. DMBA, however, decreased humoral response by 62-70% up to 100 days after treatment. The effect was strain-specific since MCA did produce a suppressed humoral response in C3H/Ki mice. MCA also had no effect on methylated bovine serum albumin-induced hypersensitivity in BALB/c mice, an assay system involving a balanced humoral and cell-mediated response. The tumor potential of MCA-induced mammary tumor nodules which were transplanted into MCA pretreated syngeneic hosts was identical to that of nodules transplanted into previously untreated mice and was significantly less than that of nodules exposed directly to MCA. These results support the hypothesis that there is no simple correlation between carcinogen-induced immunosuppression and tumorigenesis in mammary tumors arising in preneoplastic outgrowths and further indicate that the immunosuppressive action of MCA is not necessary for its carcinogenic function.

4293 INDUCTION OF TUMORS IN HAMSTERS BY GRAFTING CELLS TRANSFORMED *IN VITRO* BY DIMETHYL-7,10-BENZO(*c*)ACRIDINE.

(Fr.) Markovits, P. (No affiliation), J. Coppey, A. Mazabraud and M. Hubert-Habart. *C R Acad Sci* [D] *(Paris)* 278(2):353-355, 1974.

Cell transformation *in vitro* by dimethyl-7,10-benzo(*c*)acridine, and tumor induction by grafting transformed cells thus obtained in hamsters were studied. Secondary cultures of hamster embryonal cells treated with dimethyl-7,10-benzo(*c*)acridine developed a small number of morphologically different colonies as compared with a control. Following a number of passages *in vitro*, the colonies became more uniform morphologically, more specific, and also more numerous. When inoculated in hamsters from the 6th through 12th passages, these cells induced sarcomas at the site of the injection at a rate of nearly 100%, while untreated cells were completely ineffective. The tumors, appearing 26 days after inoculation, were characterized by very rapid growth. The tumor cells infiltrated the muscular bundles and the vasculo-neural axes.

4294 DOSE-RESPONSE STUDIES ON THE ABILITY OF 7,12-DIMETHYLBENZ(α)ANTHRACENE TO INITIATE SKIN TUMORS.

(E.) Slaga, T. J. (Fred Hutchinson Cancer Res. Cent., Seattle, Wash.), G. T. Bowden, J. D. Scribner and R. K. Boutwell. *J Natl Cancer Inst* 53(5):1337-1340, 1974.

A dose-response study was initiated to study the ability of strongly and weakly carcinogenic hydrocarbons to induce skin tumors in Charles River CD-1 mice. Seven to twelve-week-old female mice were shaved and treated topically or i.p. with 7,12-dimethylbenz(α)anthracene (DMBA) or benz(α)anthracene (BA). A single topical dose of 0.5, 5, 10, 20, 100, or 200 nM DMBA, followed one week later by twice weekly applications of 0.25% croton oil, induced 0.4, 2.3, 6.0, 5.5, 6.2, and 16 papillomas/mouse, resp., within 24 weeks. One topical application of 5, 40, or 200 nM DMBA, followed by twice weekly applications of 17 nM 12-O-tetradecanoylphorbol-13-acetate (TPA), produced 3, 8, 15, and 26 papillomas/mouse within 20 weeks. When DMBA was injected i.p. in amounts of 0.6, 1.2, 2.4, or 4.8 μM, followed by twice weekly applications of 16 nM TPA, the mice developed 7.8, 11.8, 11.6, and 4.4 papillomas/mouse within 20 weeks. Application of BA (2.2 μM), followed by twice weekly applications of 16 nM TPA, produced papillomas in 50% of the treated mice within 15 weeks. A single topical application of 1.1, 2.2, 4.4, or 8.8 μM BA, followed by TPA promotion, induced 0.9, 1.6, 2.6, and 2.9 papillomas/mouse within 24 weeks. The results suggest that every complete carcinogen has both initiating and promoting abilities, whereas certain weakly carcinogenic or noncarcinogenic polycyclic hydrocarbons may have either initiating or promoting activities.

4295 ABSORPTION AND LOCAL UPTAKE OF TRITIATED 7,12-DIMETHYLBENZ(a)ANTHRACENE IN EXPERIMENTAL ATROPHIC GASTRITIS.

(E.) Capoferro, R. (Rikshosp., Oslo, Norway). *Scand J Gastroenterol* 9(6):527-532, 1974.

The absorption and gastric uptake of ^{3}H-7,12-dimethylbenz(a)anthracene (DMBA, 100 μCi/ml, administered by gastric intubation) was studied by liquid scintillation counting in inbred male Pon-Sff-c guinea pigs with irradiation gastritis. Three and 5 wk after irradiation, a significantly higher radioactivity was observed in liver and muscle samples from pylorus-ligated, x-irradiated animals, as compared with nonirradiated, nonligated controls. In the nonligated controls and animals which had been irradiated 8 weeks previously, stomach irradiation did not cause a significant change in the uptake of radioactivity by liver and muscle. On the other hand, the radioactivity of the gastric wall was increased in both ligated and nonligated animals irradiated 3 or 5 wk previously. This may be related to the altered secretion of mucus or to an increased cellular proliferation following x-ray injury to the mucosa.

4296 DEMONSTRATION OF TUMOR-ASSOCIATED TRANSPLANTATION ANTIGENS IN RAT MAMMARY TUMORS INDUCED BY 7,12-DIMETHYLBENZ(a)ANTHRACENE.

(E.) Silinskas, K. C. (Dept. Biol., U. Windsor, Ontario, Canada), W. Fang and T. K. S. Mukkur. *Oncology* 29(4):273-282, 1974.

Mammary adenocarcinomas were induced by p.o. administration of 20 mg of 7,12-dimethylbenz(a)anthracene to Sprague-Dawley (SD) rats. Antibodies to the pooled tumor cells produced in Wistar rats were made tumor-specific by successive absorption with pooled SD red blood cells, normal mammary cells, and normal serum. Such antibodies were found to be cytotoxic to the original pooled tumor cells as well as to the pools prepared from other animals, thus suggesting the existence of antigenic cross-reactivity in such hydrocarbon-induced tumors. The observed cross-reactivity was probably due to a difference in the antigenic determinants on the surfaces of the normal and transformed mammary cells. This view is supported by the observation that untreated tumor cells were 90% transplantable, while those pretreated with specific antibody did not grow after transplantation.

4297 THE EFFECT OF PHENFORMIN ON THE INDUCTION OF MAMMARY GLAND TUMORS IN RATS.

(Rus.) Dilman, V. M. (N. N. Petrov Inst. Oncol., Leningrad, USSR), L. N. Bershtein, M. A. Zabezhinskii and V. A. Aleksandrov. *Vopr Onkol* 20(9):94-98, 1974.

The effect of phenformin on DMBA-induced mammary tumors was studied in 32 albino random-bred rats injected in the tail vein with 2 mg 7,12-dimethyl(a)-benzanthracene. Sixteen of these animals were then force-fed daily 5 mg phenformin in 1 ml of water, while 16 controls were each given 1 ml of physiological saline. The phenformin was administered for 2.5 months. The first tumors were discovered in the controls 2 months after DMBA administration (6 adenomas and fibroadenomas; 35 adenocarcinomas; 3 other types). In the experimental group, tumors were discovered 3 weeks later than in the controls (3 benign tumors; 9 high-differentiated; 1 other type). Tumor incidence in the control group was 100%; in the experimental, 42.9%. The results show that phenformin inhibited e development of DMBA-induced mammary tumors. It suggested that the anticarcinogenic action of enformin may be related to the induction of enzymes fecting DMBA metabolism.

98 THE INTERACTION OF CELLULAR AND SERUM IMMUNITY FACTORS IN CHEMICAL CARCINOGENESIS.

us.) Maiskii, I. N. (Sci. Res. Lab. Exp. Immuno- ol., Moscow, USSR), G. P. Airapetian, R. B. Gudkova d L. D. Krylov. *Biull Eksp Biol Med* 77(11):86-89, 74.

mors were induced in Wistar rats by a single i.m. jection of 3 mg dimethylbenzanthracene (DMBA) in 5 ml peach oil to study the effect of serum com- nents on cellular immune reactions by inhibiting gration of peritoneal macrophages from the capil- ries. Culture of macrophages in autol- ous sera from animals with induced tumors resulted greater inhibition of macrophage migration in a rger number of cases (61%) than did the use of nor- l sera in the test-system (44%). Normal sera nded to enhance the migration of macrophages more an did the sera of tumor-bearing rats. By the sixth nth of carcinogen treatment, immune cullular reac- ons decreased sharply irrespective of the serum fect.

99 STIMULATION OF DNA SYNTHESIS IN MURINE EPIDERMIS DURING THE INITIATION OF CANCER.

us.) Raicheva, E. (Inst. Chem.Phys., Moscow, USSR) d O. S. Frankfurt. *Biull Eksp Biol Med* 77(4):93- , 1974.

ncer was induced in three-month-old C3HA mice by inting their skin with two drops of 1.5% 9,10-di- thylbenz[a]anthracene (DMBA) in mineral oil (ap- oximately 600 μg of DMBA); 150 μg of benzo[a]pyrene P) in acetone; or 120 mg of urethan in acetone. ethan was applied 18 hr after application of a 0.5% lution of croton oil in acetone and five wk later, .02, 0.1 or 0.5% croton oil solution was applied to e same area. ^{3}H-Thymidine (1 μCi/g) was injected .p. every four hr six or seven times, starting si- ltaneously with application of croton oil. The re- lts indicate that skin applications of DMBA, BP or ethan five wk prior to application of croton oil ccelerated the transition of basal cells into the -phase. The greatest effect was noted 12-20 hr after pplication of 0.1% croton oil. The labelling index f differentiated cells was also significantly in- reased after initiation with DMBA, BP and urethan.

300 THE EFFECT OF LARGE DOSES OF THYROCALCITONIN ON METASTASIZING INDUCED SARCOMAS IN RATS.

us.) Kashulina, A. P. (P. A. Gersten Inst. Oncol., scow, USSR), I. P. Tereschenko, M. V. Golovanou and . I. Briskin. *Vopr Onkol* 20(5):54-57, 1974.

xperiments were performed on 32 male Wistar rats with imethylbenzanthracene (DMBA)-induced sarcomas which ere injected i.m. or i.p. with thyrocalcitonin (TCT) 6 Medical Research Council U/100 g/day). The animals urvived for 1.5-3 months. The control group consisted of 41 tumor-bearing rats. Eighteen terminal experimental animals and 25 terminal controls were sacrificed to determine total Ca^{++} content of the tumor. The results showed that 18 (56.3%) experimental and 12 (29.3%) control rats had metastases. In the controls, metastases occurred mainly in the lymph nodes and in 6 cases, in the lungs. In the experimental group, 12 animals had pulmonary metastases. The average weight of the tumor did not differ significantly: 27.3 ± 1.5 g in the controls and 28.7 ± 1.7 g in the experimental animals. TCT did not affect the total Ca^{++} content of the tumors (2.30 ± 0.2 mg/g). In the tumors of control rats with spontaneous metastases, the total Ca^{++} content was significantly lower (1.97 ± 0.297 mg/g) than in tumors of controls with no metastases (2.84 ± 0.253 mg/g). It is suggested that TCT enhances metastatic growth by redistribution of Ca^{++} (intra- and extra-cellular) and the formation of TCT-Ca complexes.

4301 INDUCTION OF ARYL HYDROCARBON (BENZO[a] PYRENE) HYDROXYLASE AND TYROSINE AMINOTRANSFERASE IN HEPATOMA CELLS IN CULTURE.

(E.) Whitlack, J. P., Jr. (Natl. Cancer Inst., Bethesda, Md.), H. Miller and H. V. Gelboin. *J Cell Biol* 63(1):136-145, 1974.

The induction of aryl hydrocarbon hydroxylase (AHH) and tyrosine aminotransferase by benz(a)anthracene (1 μg/ml) and dexamethasone (1 μM) was studied in cultured Reuber (H35) hepatoma cells. Cell homogenate AHH activity was stimulated 25-fold over the first 8 hr and aminotransferase activity was stimulated 1.5 to 2-fold relative to controls over the first 4 hr after addition of benz(a)anthracene. Increased hydroxylase activity, however, showed a longer duration of response than did aminotransferase. Dexamethasone produced a 6-fold increase in aminotransferase activity over the first 8 hr but had no effect on AHH activity. The lag phase preceeding enzyme induction was the same for both enzymes (1 hr). In addition, the benz(a)anthracene and dexamethasone concentrations necessary for enzyme induction were similar. Studies in which cells were stimulated with inducers in the presence of actinomycin D, 3'-deoxyadenosine or cycloheximide showed that both RNA and protein synthesis were necessary for enzyme induction. The fact that both enzymes could be induced in the presence of actinomycin D or 3'-deoxyadenosine following a 4-hr incubation in the presence of inducer plus cycloheximide indicated that the transcriptional and translational steps for induction could occur independently. Addition of benz(a)anthracene and dexamethasone simultaneously produced increases in activities of both enzymes to levels higher than those produced with either inducer alone. The synergistic effect occurred at the pretranslational level. These results suggest that the requirements for macromolecular synthesis are similar for induction of each enzyme.

4302 EFFECT OF GASTRIC JUICE ON BENZO(a)PYRENE.

(Rus.) Sherenesheva, N. I. (Inst. Exp. Clin. Oncol., Moscow, USSR), L. G. D'iakova and A. P. Il'nitskii. *Vopr Onkol* 20(5):88-89, 1974.

To study the effect of gastric juice on benzo[a]pyrene (BP), 1 ml of BP solution in bovine serum (1 µg/ml) and 9 ml of human or horse gastric juice were thoroughly stirred and incubated at 37 C for 3 and 5 hr. The BP content in benzene extracts was determined by fluorescence spectrometry. After three hours of incubation, the BP content in hypochloric gastric juice was 0.069 ± 0.026 µg/ml; in normochlorhydric gastric juice, 0.09 ± 0.025 µg/ml; and in hyperchloric gastric juice, 0.104 ± 0.09 µg/ml. After five hours of incubation, the BP content was 0.08 ± 0.016, 0.085 ± 0.032, and 0.092 ± 0.011 µg/ml, resp. These experiments demonstrated that gastric juice does not destroy BP. Instead, the carcinogen is bound by proteins in gastric juice.

4303 DNA SYNTHESIS AND TRANSFORMATION INDUCED IN DENSITY-INHIBITED CULTURES OF HAMSTER EMBRYO CELLS BY THE CARCINOGEN BENZO(a)PYRENE.

(E.) Mironescu, S. (Am. Natl. Red Cross, Blood Res. Lab., Bethesda, Md.) and R. Love. *Cancer Res* 34(10):2562-2570, 1974.

The effect of the carcinogen benzo(a)pyrene (BP) on DNA replication in density-inhibited cultures of Syrian *(M. auratus)* hamster embryos (LVG:LAK) was studied. BP (0.01-10 µg/ml) stimulated DNA synthesis in a measurable fraction of cells in density-inhibited cell cultures. The proportion of cells responding increased linearly over the dose range of the BP. Kinetic analysis after a dose of 10 µg indicated a G_1 and S period of 6 and 11 hr, resp. The cells stimulated to initiate DNA synthesis (8-10% of the exposed population) were unable to enter mitotis. Tests with WI 38 cells, which cannot metabolize BP, or with the noncarcinogenic derivative pyrene, and hamster cell cultures, indicated that both metabolic activation and carcinogenicity of BP are needed for its ability to cause DNA synthesis. Two types of BP-induced DNA synthesis were identified (TdR-^{3}H, 1 µCi/ml concentration) with respect to their sensitivity to 10 mM of hydroxyurea (HU). Thirty percent of the BP-stimulated cells underwent HU-resistant (repair) DNA synthesis. Colonies with criss-cross or random orientation of cells were obtained after plating the cultures treated at confluency with BP. Transformation frequency depended on the duration of BP exposure, and was maximal with the cells plated at the peak of HU-sensitive type of carcinogen-induced DNA synthesis, before HU-resistant DNA synthesis was terminated. The results of tests with WI 38 cells suggest that the intracellular metabolism of BP plays an important part in induction of DNA synthesis.

4304 COMPARATIVE STUDY OF H AND M SUBUNITS OF LACTATE DEHYDROGENASE IN TUMORS INDUCED BY METHYLCHOLANTHRENE, IN ADJACENT TISSUES, AND IN NORMAL TISSUES OF MICE.

(Fr.) Garrido Malo, M. A. (Inst. Biochem., San Marcos Natl. Univ., Lima, Peru), C. Tejada de la Torre, L. Negron, Z. I. Arnao and C. Saravia. *Bull Acad Natl Med (Paris)* 158(6):414-418, 1974.

3-Methylcholanthrene was injected s.c. in 34 Swiss albino female mice. When the resulting tumors reached a size sufficient for assay after four to eight wk, the animals were sacrificed and extracts for enzymatic determinations were taken from the various organs. The activity of lactate dehydrogenase (LDH) was elevated in almost all organs of the injected animals, especially in the liver, spleen and lung. LDH activity was slightly reduced in the RBC. Electrophoresis of LDH from various organs showed no significant difference between the injected animals and controls, except that in 4 of 9 injected animals an extra cathode band was located next to the LDH5 cathode band in the lungs of tumor-bearing mice. Its origin is unexplained. The liver to muscle ratio of LDH isoenzymes in the tumor was very low, indicating that the enzyme is predominantly of the muscle type in this variety of tumor.

4305 REQUIREMENT OF L-SERINE FOR ENZYMIC ACTIVATION OF CARCINOGEN, 4-HYDROXYAMINOQUINOLINE 1-OXIDE.

(E.) Tada, M. (Aichi Cancer Cent. Res. Inst., Nagoya, Japan) and M. Tada. *Gann* 65(3):281-284, 1974.

The requirement for L-serine for enzymic activation of the carcinogen, 4-hydroxyaminoquinoline 1-oxide (4-HAQO), was studied using rat ascites hepatoma cells (AH-130) and baker's yeast. The enzyme was prepared from hepatoma cells and from baker's yeast using fractionation and precipitation, and autolysis with toluene, resp. The enzyme activity was determined by measuring the binding of ^{3}H-4-HAQO to nucleic acid. The 4-HAQO-binding reaction was stimulated by L-serine (67.2 mM concentration) as well as the active fraction of ascites cell extract. It was also stimulated to some extent by L-proline. Binding of 4-HAQO by ascites cell enzyme(s) was stimulated by L-serine or L-proline, while yeast enzyme required only L-serine. A stringent requirement for L-serine in addition to ATP and Mg^{++} was demonstrated for 4-HAQO-activating enzymes of both mammalian and yeast cells. It is suggested that purification of the enzymes is necessary to determine the mechanism of 4-HAQO-binding and its relation to carcinogenesis.

4306 ANDROGENS IN BREAST CANCER.

(E.) Grattarola, R. (Tumor Inst., Milan, Italy). *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna. April 4-6, 1973.* 1:197-198, 1974.

The role of androgens in the development of breast cancer and of endometrial hyperplasia and the possibility that increased androgenic activity originates from hyperplastic interstitial tissue of the ovary were investigated. The urinary testosterone content was determined in 20 breast cancer patients regarded as clinically well 7-14 yr after mastectomy and in nine breast cancer patients who developed lung and/or bone metastases during the same time period. All patients were 55-62 yr old. Ten postmenopausal women (52-65 yr old) without breast cancer served as controls; their endometrium was examined and found to be hypotrophic. Urinary testosterone levels in breast cancer patients without metastasis did not differ significantly from controls (9.8 µg/day and 9.1 µg/day, resp.). Testosterone excretion levels

re significantly elevated above normal in breast
ncer patients with metastases (28.9 μg/day). O-
riectomy was performed in five of these; histo-
gic examination of the ovaries revealed hypertro-
ic interstitial cells scattered throughout the
roma in all five. The endometrium, examined be-
re ovariectomy, was found to be highly prolifer-
ive. Since increased androgenic activity may be
aced to an ovarian abnormality (i.e., interstitial
ll hyperplasia), it is suggested that ovariectomy
age-selected cases of endometrial hyperplasia
uld be a prophylactic against breast cancer.

07 *IN VITRO* BINDING OF RADIOIODINATED HUMAN PLACENTAL LACTOGEN TO MURINE MAMMARY GLAND.
.) Sheth, N. A. (Cancer Res. Inst., Tata Mem. Cent.,
mbay, India), K. J. Ranadive and A. R. Sheth. *Eur
Cancer* 10:653-660, 1974.

e *in vitro* binding of ^{125}I-labeled human placen-
l lactogen (HPL) to mammary tissue homogenates
om C3H (Jax) virgin female mice, a strain highly
sceptible to spontaneous mammary tumorigenesis,
s studied. Binding of ^{125}I-HPL (3025 ng) to the
0 g pellet of mammary homogenates (3-12 mg protein)
s dependent upon the amount of HPL and the amount
target protein and was competitively inhibited
unlabeled HPL (25-200 ng). Differential centri-
gation studies showed that ^{125}I-HPL bound to the
,000 g (mitochondrial) and 100,000 g (microsomal)
actions to a greater extent than to the 800 g
llet. Binding was increased in the presence of
luene sulphonyl arginine methyl ester, a protease
hibitor, collagenase, and theophylline. It was
creased in the presence of chymotrypsin and was
affected by trypsin, proteinase, DNase, or RNAse.
^{5}I-HPL bound to the 800 g pellet to a 4-fold
eater extent than ^{125}I-human chorionic gonadotropin;
nding of ^{125}I-human luteinizing and follicle stimula-
ng hormones was insignificant. Binding of ^{125}I-HPL
mammary homogenates from C57BL mice, a strain resis-
nt to spontaneous mammary tumorigenesis, was 6-fold
ss than to that from sensitive C3H (Jax) mice.

08 CARCINOGENIC EFFECTS OF ORAL DIETHYLSTILBESTROL ON C3H MALE MICE WITH AND WITHOUT
E MAMMARY TUMOR VIRUS. *(E.)* Gass, G. H. (Physiol.
p., Southern Illinois Univ., Carbondale), J. Brown
d A. B. Okey. *J Natl Cancer Inst* 53(5):1369-1370,
74.

olonged oral diethylstilbestrol (DES) exposure and
e presence of mouse mammary tumor virus (MMTV) in
entual mammary tumor formation was studied in cas-
ated C3H/An male mice (with the mammary tumor virus)
d C3H/Anf castrated male mice (presumably free of
e virus). Mice of both substrains were observed
r mammary tumor formation during 18 months on either
S-containing (at 250 ppb) or control (DES-free)
ets, while others were observed for 12 months. In
oups on control diets, no mammary tumors were found
80 C3H/An mice, and only one tumor was found in
C3H/Anf mice. In groups receiving DES, tumor in-
dence was 45/80 for C3H/An and 5/80 for C3H/Anf
ice. The results showed that oral intake of DES was highly carcinogenic in genetically susceptible, MMTV-bearing mice but has little or no carcinogenic activity in MMTV-free mice of the same strain, even when administered continuously for as long as 18 months. The mechanism of interaction between the hormone and virus in tumor initiation/promotion is unknown.

4309 AUTONOMOUS DERIVATIVES OF ESTROGEN-INDUCED RENAL CARCINOMAS AND SPONTANEOUS RENAL TUMORS IN THE SYRIAN HAMSTER. *(E.)* Kirkman, H. (Stanford Univ. Sch. Med., Calif.). *Cancer Res* 34(10):2728-2744, 1974.

The characteristics of several newly-established autonomous and spontaneous Syrian hamster renal tumor lines, including detailed descriptions of one spontaneous and seven "autonomous" derivatives of estrogen-dependent renal carcinomas, are presented. A tumor was determined to be autonomous when it was able to grow progressively in intact hosts of either sex. Tumors were initiated in females by repeated s.c. implants of diethylstilbestrol (15 mg) and were passed *in vivo* by subpannicular transplantation in estrogen- and/or androgen-treated hosts until autonomous growth became possible. In general, although androgen inhibits estrogen tumorigenesis in Syrian hamster kidney, it could be substituted successfully for estrogen in maintaining growth of early passages. Hormone dependency was usually lost between the 12th and 20th serial passage. These "autonomous" derivatives, however, retained hormone responsiveness to varying extents and none has been as completely autonomous as the spontaneous renal carcinoma reported. Removal of hormonal support from early tumor transplants inhibited or prevented tumor cell division but did not necessarily prevent tumor cell survival. Although some hosts for these autonomous tumors had atrophic testes, other secondary sex characteristics were normal, suggesting that the tumors themselves might be synthesizing physiologically active sex hormones. Progression from hormone dependency to autonomy in serial passages occurred focally with different areas within a given tumor showing different degrees of hormone dependency. Although the common origin of the epithelia of the renal nephron and of male and female sex organ tissues is undoubtedly involved in the relative sensitivity of these tissues to sex hormone tumorigenesis, the exact role is unknown.

4310 STUDIES ON THE NITROSATION OF SECONDARY AMINES IN BUFFER SOLUTIONS AND IN HUMAN GASTRIC JUICE. *(Ger.)* Ziehbarth, D. (Cent. Inst. Cancer Res., Berlin-Buch, Germany). *Arch Geschwulstforsch* 43(1):42-51, 1974.

The nitrosation of morpholine, methylbenzylamine, methyl-(1-methyl-2-cyclohexylethyl)amine, dimethylamine, diethylamine, and piperidine was studied in buffered aqueous solutions (0.5 M citric acid solution and 0.5 M disodium hydrogen phosphate solution) and in human gastric juice in the presence of sodium nitrite.
The optimum pH for nitrosation was between 2.8 and 3.0 for all amines investigated. Under the standard measurement conditions (amine concentration 0.02 mol/

liter, nitrite concentration 0.04 mol/liter, temperature 37 C, reaction time 6 hr, pH near 3.0), the yield of N-nitroso compounds was 100% for morpholine, 71% for methylbenzylamine, 12% for dimethylamine, 4.6% for piperidine, 3.5% for methyl-(1-methyl-2-cyclohexylethyl)amine, and 2.9% for diethylamine. Synthesis of N-nitroso compounds also occurred under unfavorable conditions in the stomach (normal gastric juice, and shorter reaction time). The results are interpreted as a cancer risk factor for humans because of the ingestion of secondary amines in the form of drugs and food additives, together with nitrite and nitrate which are present in food and drinking water. Of the amines studied, diethylamine and methyl-(1-methyl-2-cyclohexylethyl)-amine are components of drugs, while morpholine is used both in drugs and as a food preservative. The p.o. administration of secondary amine drugs should be restricted or avoided, or secondary amines should be replaced by preparations not subject to nitrosation.

4311 INDUCTION OF LUNG AND BLADDER TUMORS IN RATS BY DI-*n*-BUTYL NITROSAMINE IN DIMETHYL SULFOXIDE.

(Ger.) Sander, J. (Inst. Hyg., Univ. Tubingen, Germany), G. Burkle and V. Burkle. *Z Krebsforsch* 82(1):83-89, 1974.

Induction of lung and bladder tumors by di-*n*-butyl nitrosamine in dimethylsulfoxide (DMSO) was studied in male SIV-50 rats. The animals were given total doses of 10.4 or 5.2 g/kg (400 mg/kg/wk or 200 mg/kg/wk s.c.). Tumor development was followed by x-ray examinations until 420 days after the first injection. While there were no tumors in 20 controls treated with DMSO alone, 23 of the 24 nitrosamine-treated rats developed lung tumors and 18 developed bladder tumors. Tumors were found in all animals on the 242nd day of the experiment. The lung tumors consisted of large or small nodules and were located primarily in the lung periphery. Circumscribed alveolar-cell hyperplasia; keratinized, undifferentiated squamous-cell carcinomas; adenomas; and adenocarcinomas were found in the lungs in histological examinations. The bladder tumors were mainly polypous and located in the lumen. Extensive infiltrations of the bladder wall and perivesical tissue were observed. These tumors were identified histologically as papillary transitional-cell tumors with varying degree of cellular and nuclear polymorphism. Squamous-cell metaplasia and differentiated, keratinized, squamous-cell carcinomas were also found. Osteolytic metastases, as well as osteolytic and osteoplastic tumor processes, were found in two and four cases, resp.

4312 RENAL TUMORS INDUCED BY DIETHYLNITROSAMINE AFTER PARTIAL HEPATECTOMY: MORPHOLOGY AND GROWTH BEHAVIOR.

(Ger.) Meister, P. (Pathol. Inst. U. Munich, W. Germany) and H. Rabes. *Z Krebsforsch* 80(2):169-178, 1973.

Doses of 80 mg/kg diethylnitrosamine were injected i.p. into 3 groups of 20 male Wistar AF/Han rats 4, 16, and 24 hr after a partial hepatectomy. The number of resulting renal tumors and the survival time varied (the 4-hr group had the shortest survival time), but no differences in morphology and tumor size were found among the groups. Slightly to moderately differentiated tumors predominated. Metastases occurred rarely. Only 1 rat, injected 24 hr after hepatectomy, developed a liver tumor which was a slightly differentiated, hepatocellular carcinoma. The observed tumors are comparable to renal epithelial tumors, adenomas, and adenocarcinomas occurring in humans.

4313 NUCLEIC ACIDS AND GLYCOGEN CONTENT IN RAT LIVER WITH DIETHYLNITROSAMINE INDUCED HEPATOCARCINOGENESIS.

(Rus.) Ivanov, S. D. (N. N. Petrov Inst. Oncol., Leningrad, USSR), L. A. Voronova, M. A. Zabezhinskii, T. A. Goriukhina and I. F. Seits. *Vopr Onkol* 20(8):54-60, 1974.

Liver tumors were induced in albino random-bred male rats weighing 120-150g by adding 0.20% diethylnitrosamine (DENA) to drinking water. The animals were sacrificed fortnightly for six months. Morphologically, the tumorigenic process passed through three stages: toxic and pretumor changes, benign tumors, and malignant transformations. During the first stage RNA content decreased to 50% of the control value and then came back to normal. The ratio of RNA in the cytoplasm to RNA in the nucleus rose by 25%. The DNA content rose progressively to its maximum value (twice that of the control) by the first month, and then returned to normal. The RNA:DNA ratio decreased to 1/4 of its original value. During the second stage (2-3.5 months), hepatocellular adenomas were observed which measured 0.3-1 cm in diameter. Total RNA and nuclear RNA content was halved; RNA cytoplasm decreased 25% below the control value; DNA content was approaching the control; RNA:DNA ratio decreased to 1/3. Glycogen content rose between the second and third months to reach the control level and dropped sharply again. During the 3rd stage, 3.5-6 months after the experiment began, numerous hepatocellular carcinomas were observed. Total RNA content increased, while the ratio of RNA in the cytoplasm to RNA in the nucleus decreased, and its value was 25% higher than that of the control. Glycogen fell to a minimum of 2.5 mg/g in 4.5 months. It is concluded that during the development of DENA-induced hepatocellular tumors, nucleic acid and glycogen content pass through two stages corresponding to benign and malignant tumor growth. It is suggested that changes in the ratio of RNA in the cytoplasm to RNA in the nucleus may be related to the impaired selective transport from the nucleus to the cytoplasm.

4314 INHIBITION OF DIMETHYLNITROSAMINE-INDUCED STRAND BREAKAGE IN RAT LIVER DNA BY AMINOACETONITRILE.

(E.) Stewart, B. W. (Sch. Path., U. New South Wales, Kensington). *Biochim Biophys Acta* 366(3):261-263, 1974.

Treatment of male Wistar rats with a s.c. injection of 200 mg/kg aminoacetonitrile prevented the production of single strand breaks in hepatic DNA by dimethylnitrosamine (5 or 10 mg/kg i.p.) as determined by alkaline sucrose gradient analysis. The degree of damage following treatment with aminoetonitrile and 10 mg/kg body wt dimethylnitrosa-ne was similar to that previously reported after ministration of 1 mg/kg body wt dimethylnitrosamine one. It would appear therefore that the extent of ngle strand breakage of DNA is quantitatively re-ted to the metabolism of dimethylnitrosamine by e liver.

15 DNA SYNTHESIS IN THE LIVER AND KIDNEYS OF YOUNG RATS FOLLOWING A SINGLE NEONATAL RCINOGENIC DOSE OF DIMETHYLNITROSAMINE. *(E.)*
ronow, M. (Leeds Univ., Sch. Med., England) and G. riffiths. *Biomedicine* 20(2):119-124, 1974.

anges in the rate of DNA synthesis were measured the liver, kidney, and muscle of progeny of Wistar F rats given a single neonatal carcinogenic dose dimethylnitrosamine (0.25 μg in 50 μl water, s.c. rsal region, 24 hr after birth). The liver showed rked inhibition of DNA synthesis 48 hr after this se and it was 6 days before the treated value ached that of the control. A decrease in the abso-te amount of DNA present was also found. This pro-nged inhibition of DNA synthesis and the smaller ount of DNA present indicated a prolonged effect the carcinogen on the DNA synthesis in this tissue en after the last traces of the drug had been removed. rt of this effect can be explained by the initial sappearance of most of the hemopoietic cells for ich dimethylnitrosamine seems very toxic. However, is is insufficient to explain the very large drop specific activity of the total liver DNA 2 days af-er the dose of the carcinogen. It is possible that e prolonged inhibition of DNA synthesis may be re important in the establishment of potential tu-r cells than the alkylation of DNA. In the treated st-weanling rat liver, however, the rate of DNA syn-esis increased 3-fold. Also a greater percentage tetraploid nuclei were present. A similar smaller t consistent effect was found in the kidney of ckling animals and a 2-fold increase in the rate DNA synthesis in this organ was evident after aning. Gluteal muscle also showed a slight de-rease but rapidly normalized.

316 A SEX-DEPENDENT DIFFERENCE IN THE TYPE OF TUMOURS INDUCED BY DIMETHYLNITROSAMINE IN E LIVER OF C3Hf MICE. *(E.)*
Engelse, L. D. (Nether-ands Cancer Inst., Amsterdam), C. F. Hollander and . Misdorp. *Eur J Cancer* 10(2):129-135, 1974.

ale and female C3Hf mice were injected once i.p. th dimethylnitrosamine (DMNA, 7 mg/kg) or were ven DMNA (10 ppm) *ad lib* in their drinking water r 13 wk. Among the females treated for 13 wk th DMNA in the drinking water, 50% or more died r had to be killed because of hemorrhagic ascites. early all of the tumors in the livers of the fe-ales were of the vascular type, while hepatomas ere most frequently encountered in the males. The ascular lesions in the female livers were classi-ied as peliosis, capillary hemangioma, cavernous emangioma, or hemangioendothelioma. Hepatoma in-idence in males was significantly increased after a ingle i.p. injection; the same treatment did not result in the formation of any liver tumors in the female mice. Nonneoplastic changes in a variety of lymph nodes were found in 99-wk-old control females; these changes resembled those of the so-called mesenteric disease in which the mesenteric lymph node is primarily involved. This nonneoplastic disease was not observed in 58-wk-old controls for DMNA-treated females. The sex dependent reaction to DMNA treatment may be due to different origins from cells with dissimilar DMNA-N-demethylating activities; it might also be due to the divergent hormonal environments to which the DMNA-treated cells are exposed.

4317 RAPID LOSS OF 7-METHYLGUANINE FROM LIVER NUCLEIC ACIDS IN MICE DURING THE INITIAL STAGE OF LIVER CARCINOGENESIS INDUCED BY DIMETHYLNITROSAMINE. *(E.)*
Nemoto, N. (Dept. Exp. Pathol., Cancer Inst., Tokyo, Japan) and S. Takayama. *Biochem Biophys Res Commun* 58(1):242-249, 1974.

^{3}H-dimethylnitrosamine (DMN, 10 ppm) was administered in the drinking water to 8-wk-old male ICR/JCL mice. The radioactivity in the liver DNA and RNA of these animals increased to a maximum level after 2 wk and then decreased to 1/2 the maximal level after 4 wk. During the third and fourth weeks, the radioactivity was not accumulated and was rapidly eliminated. The nucleic acids were hydrolyzed and subjected to ion-exchange chromatography. The radioactivity was eluted mainly in the fraction containing 7-methylguanine, with the amount of radioactivity in the fractions containing guanine and adenine gradually increasing throughout the DMN treatment period. The maximal methylation of nucleic acids occurred during the first wk, while labeling was highest in the second wk. The amount of 7-methylguanine decreased rapidly, being 1/4 as much in the fourth wk as in the first week. The turnover of 7-methylguanine *in vivo* was quite rapid. The data indicated that the capacity to produce a methylating agent from DMN decreased with time. A rapid decrease in 7-methylguanine content of the RNA was also observed, the 7-methylguanine formed during the first wk having disappeared by the second wk. The rapid decrease in 7-methylguanine might be attributable to chemical depurination.

4318 ALTERATION OF TUMOR RESPONSE IN RAT LIVER BY CARBON TETRACHLORIDE. *(E.)*
Taylor, H. W. (Biol. Div., Oak Ridge Natl. Lab., Tenn.), W. Lijinsky, P. Nettesheim and C. M. Snyder. *Cancer Res* 34(12):3391-3395, 1974.

Carbon tetrachloride was administered to rats in combination with aminopyrine and sodium nitrite to enhance the liver tumor formation induced by these substances. Eighteen Sprague-Dawley rats were given a solution of aminopyrine and sodium nitrite, each at a concentration of 1000 mg/liter of water, in 20 ml aliquots per rat, five days/week for 30 weeks. A 0.2 ml dose of a 1:9 mixture of carbon tetrachloride and olive oil was given i.g. biweekly for the 30 weeks. A second group of 18 rats was given dimethylnitrosamine at a concentration of 40 mg/liter of water five days/week for 30 weeks. A third group of 12 rats received carbon tetrachloride only, at the same dosage and schedule as the first group. Controls were from an earlier experiment which used only aminopyrine and sodium nitrite at the same dosage and schedule as this experiment. Postmortem examinations were performed immediately after natural death. In the case of the group receiving carbon tetrachloride only, however, two rats were sacrificed at 6, 12, 18 and 30 weeks. Two rats were also sacrificed 72 hr after the last injection, and four at 68 weeks. Liver tissue was stained with hematoxylin and eosin and examined by light microscopy. All the rats given the aminopyrine, nitrite, and carbon tetrachloride died within 35 weeks and exhibited a severe degree of postnecrotic cirrhosis. Five rats died before 25 weeks and had no tumors, but nine developed hemangioendothelial sarcomas and six, hepatocellular tumors, including two rats with both types. The rats given dimethylnitrosamine all developed Kupffer cell sarcomas, but there were no hepatocellular tumors or cirrhosis. It is concluded that the Kupffer cells are more responsive to dimethylnitrosamine than liver cells, but hepatocytes do respond to carcinogenic stimulus in the presence of carbon tetrachloride.

4319 PROMOTING EFFECT OF BILE ACIDS ON COLON CARCINOGENESIS AFTER INTRARECTAL INSTILLATION OF *N*-METHYL-*N'*-NITRO-*N*-NITROSOGUANIDINE IN RATS. *(E.)* Narisawa, T. (Am. Health Found., New York, N.Y.), N. E. Magadia, J. H. Weisburger and E. L. Wynder. *J Natl Cancer Inst* 53(4):1093-1097, 1974.

The effect of two bile acids, sodium taurodeoxycholate (TDC) and lithocholic (LC) acid, on the incidence of large-bowel neoplasms induced by a single intrarectal dose (4 mg) of N-methyl-N'-nitro-N-nitrosoguanidine (MNNG) was studied using male and female Charles River CD-Fischer rats (6-7 weeks old). No colon tumors were found in the groups given only the LC (1 mg/weekly for 13 months) or TDC (same dosage), which suggested an absence of carcinogenic activity for these bile acids. In groups receiving the bile acids plus the MNNG there was an increased frequency of colorectal neoplasms. The MNNG + LC group had 52% neoplasms and the MNNG + TDC group had 62% neoplasms, while the MNNG group had only 25% with neoplasms. The lesions were like those induced by MNNG alone and most of them were polyploid adenomas, with adenocarcinoma being the second most frequent type. The bile acids acted as promoters of carcinogenesis.

4320 NITROSOGUANIDINE MUTAGENESIS DURING NUCLEAR AND MITOCHONDRIAL GENE REPLICATION. *(E.)* Dawes, I. W. (Dept. Microbiol., U. Edinburgh, Scotland) and B. L. A. Carter. *Nature* 250(5469):709-712, 1974.

The mutagenic effect of N-methyl-N'-nitro-N-nitrosoguanidine (NG) during DNA replication in yeast was studied, as was the feasibility of using NG mutagenesis to study the timing of individual nuclear gene replication. NG induces mutations at two stages of the cell cycle. One stage is coincident with nuclear DNA replication while the other is late in the cell cycle and may be that at which mitochondrial genes are replicated. A particular nuclear gene is susceptible to NG mutagenesis only at a specific time during S phase and different unlinked nuclear genes are sensitive at different times during S phase. NG is presumed to act during gene replication, and it should be possible to determine in yeast the temporal pattern of chromosomal replication at the gene level.

4321 GLYCOGEN AND GLUCOSE-6-PHOSPHATASE DURING MALIGNANT TRANSFORMATION OF RAT LIVER BY N-NITROSOMORPHOLINE. *(Ger.)* Bannasch, P. (German Cancer Res. Cent., Heidelberg) and H. Angerer. *Arch Geschwulstforsch* 43(2):105-114, 1974.

The glycogen content, endoplasmic reticulum and glucose-6-phosphatase were investigated by light and electron microscopy in rat liver parenchyma during early and late stages of nitrosomorpholine-induced carcinogenesis. Male Sprague-Dawley rats were fed solutions containing 12 mg/100 ml N-nitrosomorpholine (20 ml/day) for 2 to 10 weeks, 6 days a week and were killed at various times during, and between 2 wk to 15 months after administration of carcinogen. Another group was given N-nitrosomorpholine p.o. (50 mg/100 ml) for 2-3 wk and was killed during and 4 wk to 15 months after administration of carcinogen. Reversible, persistent and progressive changes were demonstrated. The reversible changes were characterized by glycogen loss primarily in the center of acini; ergastoplasm disorganization; and reduction of enzyme activity resulting from ergastoplasm disorganization. These changes are attributed to the nonspecific "concentration effect" of N-nitrosomorpholine. Persistent changes were primarily characterized by excessive glycogen storage, which was generally accompanied by a dislocation and relative reduction of the ergastoplasm and sometimes by hypertrophy of the smooth endoplasmic reticulum. The endoplasmic reticulum membranes of storage cells displayed a normal glucose-6-phosphatase activity during the early stages of the experiment. Later on, the endoplasmic reticulum membranes of many storage cells did not show any enzyme activity at all. The progressive loss of glucose-6-phosphatase activity was often accompanied by a gradual glycogen reduction; this is characteristic of the transformation of glycogen storage cells into hepatoma cells. It is concluded that the reduction of the glucose-6-phosphatase activity does not cause hepatocellular glycogenosis but accompanies or results from it. The frequently observed correlation between the reduction of the enzyme activity and glycogen loss may suggest that these two phenomena are associated with shifts in the intracellular metabolism in a similar manner during the early stage of the tumor growth.

4322 4-NITROQUINILONE 1-OXIDE-INDUCED DELETION MUTATIONS IN *ESCHERICHIA COLI* STRAINS WITH DIFFERENT DNA REPAIR CAPACITIES. *(E.)* Yamamoto, K. (Fac. Med., Osava Univ., Osaka, Japan) and Y. Ishii. *Mutat Res* 22:81-83, 1974.

The carcinogen, 4-nitroquinoline 1-oxide (4NQO) which induced deletion mutations in strains of *E.*

coli (parental strain H/r30 of B/r type, an argF$_{am}$ marker, and its radiosensitive derivatives uvrA$^-$, polA$^-$, and recA$^-$) was studied. The genes colB, tonB, and trp genes of the chromosome of *E. coli* were examined for deletions. Comparison of the yields of 4NQO-induced deletion mutations showed: uvrA$^-$ had 30 times higher sensitivity to deletion mutations compared to the parental strain; recA$^-$ showed no significant increase; and polA$^-$ had a greater sensitivity than the parental strain. These results agreed with UV-induced deletions. It was concluded that 4NQO-induced deletion mutations were mostly due to 4NQO damage remaining unexcised and that the damage probably provoked a recA$^-$-dependent repair system which leads to errors of repair.

4323 TUMOR INDUCTION IN THE PROGENY OF MICE RECEIVING 4-NITROQUINOLINE 1-OXIDE AND *N*-METHYL-*N*-NITROSOURETHAN.

(E.) Nomura, T. (Osaka Univ. Med. Sch., Japan), E. Okamoto, N. Tateishi, S. Kimura, Y. Isa, H. Manabe, and Y. Sakamoto. *Cancer Res* 34(12):3373-3378, 1974.

The carcinogenic effects of 4-nitroquinoline 1-oxide and *N*-methyl-*N*-nitrosourethan were studied on the progeny of mice who received these drugs during pregnancy or lactation. Eight to ten week old ICR/Jcl mice were given s.c. injections of 0.5% 4-nitroquinoline 1-oxide suspension (25 μg/g) on day 9, 13, or 17 of gestation, or within 12 hr after delivery. Five received two additional treatments at five day intervals. Another set of mice were given s.c. injections of a 0.05 or 0.01% *N*-methyl-*N*-nitrosourethan solution (5 μg/g) on day 9, 11, 13, 15, or 17 of gestation, and in some cases a 1 μg/g dose was given on day nine. Offspring were separated from the mothers at four weeks after birth and sacrificed at 32 or 38 weeks after birth for the nitroquinoline and nitrosourethan-treated groups, resp. Controls received s.c. injections of distilled water during pregnancy and their offspring were sacrificed 40 weeks after birth. Specimens were fixed in formaldehyde and examined by light microscopy. The nitroquinoline given once only on day 13 or 17 caused a significantly higher incidence of lung tumors than in controls. There was also a significant difference in incidence of lung tumors between those receiving the drug once only on day 17 (9/20) and those receiving it within 12 after delivery (6/37). Those receiving it on day nine had no significant tumor incidence. Lung tumors were not observed in those receiving the nitrosourethan on day 11 or later. Those receiving the 5 μg/g dose on day nine showed lung tumors (10/44), hepatomas and some malformations. When the nitroquinoline was administered within 12 hr after delivery, incidence of lung tumors was higher than in controls but not to a significant degree. The two additional treatments with the drug resulted in a significantly high incidence (11/45) of lung tumors and development of hepatomas. Mothers receiving either drug during pregnancy or lactation also developed a significantly high incidence of lung tumors. It is concluded that 4-nitroquinoline 1-oxide crosses the placental barrier more easily than the *N*-methyl-*N*-nitrosourethan, and that its active ingredient is excreted in the milk.

4324 PHORBOL-12-MYRISTATE-13-ACETATE EFFECT ON CYCLIC ADENOSINE 3',5'-MONOPHOSPHATE LEVELS IN MOUSE SKIN AND INHIBITION OF PHORBOL-MYRISTATE-ACETATE-PROMOTED TUMORIGENESIS BY THEOPHYLLINE.

(E.) Belman, S. (New York Univ. Med. Cent., N.Y.) and W. Troll. *Cancer Res* 34(12):3446-3455, 1974.

The effect of phorbol-12-myristate-13-acetate on cyclic adenosine 3,5'-monophosphate (cAMP) levels in mouse skin and inhibition of phorbol-myristate-acetate promoted tumorigenesis by theophylline were investigated. Phorbol myristate acetate, as a 15 μg/0.2 ml solution in acetone was applied to the clipped backs of five female Swiss Millerton mice at various times before sacrifice. The skins were homogenized and assayed for cAMP. There was a decrease in cAMP 1 hr after treatment; at 2 hr, a minimum was reached and maintained for 24 hr. At 48 hr, the cAMP level rose to control or greater values. The decrease in cAMP levels is one of the earliest events occurring after phorbol ester treatment and may be involved in tumor promotion. To test this, 12 mice were treated with 50 μg 6, N^6,O$^{2'}$-dibutyryl-cAMP (DBc AMP) plus 50 μg theophylline in 10% dimethyl sulfoxide/acetone during the phorbol ester promotion stage. This treatment markedly inhibited tumor promotion. This is more emphatically demonstrated by the small size of the papillomas in the treated mice as compared with the controls. The treated mice were counted for the smallest papillomas that could be felt by a pencil point because, until about 100 days, all the papillomas were less than 1 mm. After this time they slowly grew, but at 180 days only a few were larger than 3 mm. Some carcinomas appeared after 120 days. No carcinomas were seen with the DBc AMP plus theophylline treated mice at 180 days. The results suggest that tumor promotion by phorbol ester involves a decrease in cAMP.

4325 EFFECT OF TUMOR-PROMOTING PHORBOL ESTERS AND OF ACETIC ACID ON MECHANISMS CONTROLLING DNA SYNTHESIS AND MITOSIS (CHALONES) AND ON THE BIOSYNTHESIS OF HISTIDINE-RICH PROTEIN IN MOUSE EPIDERMIS.

(E.) Krieg, L. (German Cancer Res, Cent., Heidelberg, Germany), I. Kuhlmann and F. Marks. *Cancer Res* 34(11):3135-3146, 1974.

The effect of phorbol esters on the incorporation of thymidine-^{3}H into DNA and on mitotic activity, and the inhibition by epidermal G$_1$ chalone of epidermal DNA synthesis in dorsal mouse epidermis of female NMRI mice (7-8 weeks old) was studied. Twenty nM of 12-*O*-tetradecanoylphorbol-13-acetate (TPA) caused a depression of DNA labeling for 10 hr, followed by an oscillating pattern of stimulated DNA synthesis exhibiting peaks at 18, 30, and 42 hr (500, 1100, and 600% of the control). Only a slight initial depression and one peak at 18 hr (700%) occurred with 10 times lower dose of TPA. No depression was found after application of 20 or 300 nM of the weak tumor promoter phorbol dibenzoate (PDB), but 20 nM PDB caused one peak at 18 hr (500%), and 300 nM caused two peaks at 18 and 42 hr (1150 and 400%). Acetic acid (400 μM) caused a pronounced initial depression of DNA labeling and later a biphasic elevation at 18-24 hr (300%) and 42 hr (1000%). Two nM TPA caused an oscillating pattern of mitotic activity in epidermis, with peaks at 10 and 26 hr (600 and 2200% of control). The early peak was due to the stimulation of an epidermal cell population normally arrested in the G_2 phase of the mitotic cycle. The inhibitory effect of pigskin extracts (known to contain G_1 chalone, an epidermis-specific inhibitor of DNA synthesis) was transiently diminished or abolished after treatment with TPA, PDB, or acetic acid. This inhibition could not be restored by increasing the dose of the inhibitor or by altering the time interval between the injection of the inhibitor and DNA labeling. The stimulatory effect of TPA could not be diminished by repeated injections of skin extract prior to TPA application, but G_1 chalone was found in TPA-treated epidermis. TPA was more effective in disturbing the chalone mechanism than was PDB, while nonpromoting phorbol esters neither inhibited the chalone effect nor stimulated epidermal DNA synthesis. The effect of TPA was dose dependent. TPA caused a peak of histidine incorporation into histidine-rich protein (HRP), and the maximum of HRP synthesis was seen at the time when the chalone effect was reappearing. The data support the view that the induction of hyperplasia by phorbol esters or acetic acid is due to a transient inactivation of the mechanism of G_1, and possibly G_2 inhibition.

4326 EFFECT OF TUMOR-PROMOTING PHORBOL ESTERS ON THE NORMAL AND THE ISOPROTERENOL-ELEVATED LEVEL OF ADENOSINE 3',5'-CYCLIC MONOPHOSPHATE IN MOUSE EPIDERMIS *IN VIVO*.

(E.) Grimm, W. (German Cancer Res. Cent., Heidelberg, Germany) and F. Marks. *Cancer Res* 34(11):3128-3134, 1974.

The effect of tumor-promoting phorbol esters on the basic and the β-adrenergically elevated level of cyclic AMP (adenosine 3',5'-cyclic monophosphate) in epidermis of female albino NMRI mice was studied. One to 2 hours after a single application (20 nM) of 12-*O*-tetradecanoyl-phorbol-13-acetate (TPA), an early elevation (1-3 fold) followed by a depression (50-10%) of the control and, after 20 to 60 hours, by a second late elevation (3-8 fold) of epidermal cyclic AMP was observed. The effect was dose dependent, because with 2 nM TPA the early peak was higher, but the intermediary depression was more shallow, and the late increase was not as high or long-lasting as the higher dose. Treatment with 480 nM of the weak promoter phorbol dibenzoate caused neither initial elevation nor depression, and the late peak was similar to that seen after 2 nM TPA. Both increases of cyclic AMP were prevented or interrupted by α-adrenergic but not by β-adrenergic blockade. These results suggest that the cyclic nucleotide stimulates the expression of epidermal function which occurs after stimulation of DNA synthesis and mitotic activity. After treatment with TPA the stimulating effect of isoproterenol (10 nM/g) disappeared. This inhibition of the β-receptor depended on the dose of the promoter applied, with the weak promoters being less effective.

4327 STRUCTURAL FEATURES OF STEROIDS WHICH INITIATE PROLIFERATION OF DENSITY-INHIBITED 3T3 MOUSE FIBROBLASTS.

(E.) Thrash, C. R. (California Coll. Med., Irvine), T. S. Ho and D. D. Cunningham. *J Biol Chem* 249(19):6099-6103, 1974.

The effects of several steroids varying in glucocorticoid activity were studied on DNA synthesis and cell division in density inhibited 3T3 mouse fibroblast cultures. Hydrocortisone (3×10^{-6} M) produced a 4-fold increase in the rate of incorporation of ^{3}H thymidine into DNA of density inhibited cultures 24 hr after addition of the steroid. Similar studies showed a direct correlation between the extent of stimulation of DNA synthesis, the number of cells eventually proceeding to cell division, and the degree of glucocorticoid activity of the various steroids tested. Active steroids included triamcinolone acetonide, dexamethasone, prednisolone, hydrocortisone, aldosterone, coticosterone, 11β-hydroxy-6 methylprogesterone, and 11-deoxycorticosterone. Dexamethasone, the most active agent, was 10 times more potent than hydrocortisone. Based on the experimental findings, features of the steroid molecule necessary for the proliferative response were determined; (1) a 3-carbonyl and/or a 4:5 double bond; (2) a β hydroxyl group in the configuration at C-11; (3) a C-20,21 side chain on C-17;4 (4) the presence of a 17 α-hydroxyl and a 21-hydroxyl substituent, which enhances cortisol activity; (5) the presence of certain 9 and/or 16 substituents, which reduce the concentration needed for half-maximal stimulation but do not change the magnitude of the maximal response relative to cortisol.

4328 THE SIGNIFICANCE OF THE BACTERIAL STEROID DEGRADATION FOR THE ETIOLOGY OF LARGE BOWEL CANCER. I. GROWTH CONDITIONS AND NUTRITIONAL REQUIREMENTS OF SACCHAROLYTIC BACTERIODES SPECIES.

(Ger.) Edenharder, R. (Hyg. Inst., Univ. Mainz, W. Germany). *Zbl Bakteriol Hyg [Orig B]* 159(2): 130-144, 1974.

Preliminary investigations into the growth conditions and nutritional requirements of saccharolytic *Bacteroides* species (different strains of *B. vulgatus*, *B. fragilis*, *B. thetaiotamicron*, as well as *B. tumidus* E 526, and *B. distasonis* A I 149) were carried out in connection with the hypothesis on the endogenous formation of the cancer of the large intestine. According to this hypothesis, the degradation of components of foodstuffs or intestinal secretions, such as bile acids, by certain species of intestinal bacteria leads to the production of carcinogenic or cocarcinogenic compounds. The composition of intestinal flora and the concentrations of the substrates available for bacterial metabolism are also affected by the nature of the diet. In a complex medium with brain infusion, the optimum pH for 15 strains lay between 6.7 and 7.15. The optimum growth temperature for 5 strains was 41 C. Forty-four of the 45 strains tested grew in a defined medium consisting of glucose, inorganic salts, citric acid, amino acids, vitamins, and hemin, as well as in a complex medium with brain infusion. *B. vulgatus* BM 137, *B. fragilis* NCTC 9343, *B. thetaiotamicron* NCTC 10582, and *B. fragilis* Koe 57b, as well as *B. distasonis* A I 149, required defined amino acids for their growth. Methionine was identified as the essential amino acid necessary for the growth of *B. vulgatus* BM 137. *B. distasonis* A I 149 required vitamin B12 for its growth. Amino acids as carbon or energy source permitted no growth. Some of the strains tested showed no absolute requirement for amino acids or vitamins.

4329 STUDY OF THE TUMORIGENIC PROPERTIES OF THE DOMESTIC CHEMICAL, SYNTANOL DS-10. *(Rus.)*

Sinigina, N. V. (A. N. Sysin Inst. Gen. Communal Hyg., Moscow, USSR) and Iu. I. Sakharov. *Gig Sanit* (7):109-110, 1974.

Possible carcinogenic and cocarcinogenic effects of Syntanol DS-10 were studied by skin painting in 150 female CBA x C57BL/6 mice. Syntanol DS-10 is a nonionic surfactant consisting of a mixture of polyethylene esters of synthetic C_{10} to C_{18} fatty acids. It is more biodegradable than other nonionic surfactants available in the USSR. Mice were divided into three groups: (1) mice treated with 0.5% 3-methylcholanthrene (MC) in benzene and, three wk later, twice a week with a 40% solution of Syntanol DS-10 in benzene; (2) mice treated with Syntanol twice a week without the preliminary application of MC; (3) controls treated only once with 0.5% MC. The animals were sacrificed after 41 weeks. In group (1), 29 animals had 38 papillomas. The first tumor was observed seven weeks after application of MC or four weeks after Syntanol (total dose: 29.6 mg). Five mice had squamous cell carcinoma with varying degrees of keratinization. In the second group, one papilloma was found 13 weeks after Syntanol application. These findings indicate that 40% Syntanol DS-10 in benzene is a cocarcinogen.

4330 STUDY OF CARCINOGENIC ACTION OF TRYPTOPHAN AND ITS METABOLITES. *(Rus.)*

Dzhioev, F. K. (N. N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR). *Vopr Onkol* 20(8):75-81, 1974.

The carcinogenicity of L-tryptophan, injected s.c. weekly as sunflower oil suspension (20 mg/animal) during the entire period of survival, and indole (1 mg/animal) and 3-oxyanthranilic acid (2 mg), administered for 9 months, was studied in 35 female and 15 male white rats, and 70 female and 80 male CC57W mice. An average total L-tryptophan dose was 1899 mg; indole, 39 mg; 3-oxyanthranilic acid, 51 mg. In tryptophan-injected animals tumors were observed in 8 of 28 rats which survived until the primary tumor appeared (508 days). In 3 rats malignant tumors of the uterus were observed. Of the remaining, 5 had salivary gland adenoma, 2 had mammary gland fibroadenoma, 1 had mesenteric reticulosarcoma and reticuloleucosis. Indole-induced tumors were observed in 34 animals (57%) which survived until the primary tumor. Leucosis was found in 13 mice (22%), pulmonary adenoma in 21 (35%), other tumors in 5 animals. 3-Oxyanthranilic acid produced leucoses in 5 of 18 mice (28%) which survived until the primary tumor (181 days). Findings indicate that excessive doses of tryptophan may adversely affect the hormonal balance to cause tumors of the uterus.

4331 *IN VITRO* EVALUATION OF CYTOTOXIC ACTIVITY OF NITROSOUREAS. *(Fr.)*

Serrou, B. (St. Eloi Hosp., Montpellier, France), B. Delor, T. Reme, J. L. Montero and J. L. Imbach. *C R Acad Sci [D] (Paris)* 279(8):703-706, 1974.

After labelling HeLa-S_3 cells with ^{51}Cr, tumor cells were incubated for 48 hr at 37 C in an atmosphere containing 5% CO_2 and 95% air with various concentrations (5×10^{-6} to 5×10^{-4}M) of eight different nitrosourea compounds. The percentage of cytotoxicity was determined from the amount of ^{51}Cr released into the supernatant by lysis of the tumor cells. All drugs were dissolved in dimethyl sulfoxide, which was diluted 1:200 in the medium; this concentration is not toxic for the cell cultures. Three drugs that are now used clinically, 1,3-bis(2-chloroethyl)-1-nitrosourea (BCNU), 1-(2-chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU), and 1-(2-chloroethyl)-3-(*trans*-4-methylcyclohexyl)-1-nitrosourea (methyl-CCNU), were highly cytotoxic (69%, 102%, and 120% cytotoxicity, resp., at a concentration of 5×10^{-4}M). Two experimental drugs, 1-(2-chloroethyl)-3-(2,3-O-isopropyl ideneribofuranosyl)-1-nitrosourea 5'-(*p*-N-benzoate) (RFCNU) and 2-[3-(2-chloroethyl)-3-nitrosoureido]-2-deoxyglucopyranose tetraacetate (GCNU), were also very cytotoxic (106% and 95%, resp.). Three other drugs, 1-(2-chloroethyl)-3-ribopyranosyl-1-nitrosourea 2', 3', 4'-triacetate (RPCNU), 1-(2-chloro ethyl)-3-ribofuranosyl-1-nitrosourea 2', 3', 5'-triacetate (RACNU), and 1-(2-chloroethyl)-3-xylo pyranosyl-1-nitrosourea 2',3',4'-triacetate (XPCNU) showed low levels of cytotoxicity *in vitro*. Studies are currently in progress to determine whether this technique could be used to screen other potential antineoplastic agents.

4332 THE PRESENCE OF THE S-100 PROTEIN IN METHYLNITROSOUREA INDUCED TUMORS OF THE NERVOUS SYSTEM IN DOGS. *(E.)*

Stavrou, D. (Inst. Gen. Pathol. Neuropathol., Univ. Munich, Germany) and K. G. Haglid. *Res Exp Med (Berl)* 164(1):59-61, 1974.

The neurooncogenic effect of 1-methyl-1-nitrosourea (MNU) as measured by quantitation of the glia specific S-100 protein in induced tumors of the nervous system in 10 shepherd dogs (age 1/2 to 2 hr) was studied. The dogs received monthly i.v. injections of MNU (20 mg/kg) and two dogs developed brain tumors and four developed peripheral nervous system tumors. The mean induction time was 26 (21-33) months and the mean MNU dose was 525 mg/kg. The tumors included one pleomorphic glioma, one mixed glioma of the brain, and four schwannomas with sarcomatous areas. Tumors contained levels of the S-100 protein, as determined by immunodiffusion, comparable to those found in spontaneous neuroectodermal human tumors. This suggests that MNU induced tumors of the central and peripheral nervous system of the dog are of neuroectodermal origin.

4333 RAPID AND SELECTIVE INDUCTION OF ERYTHROLEUKEMIA IN FEMALE DONRYU RATS BY 1-ETHYL-1-NITROSOUREA. *(E.)*

Ogiu, T. (Dep. Chem. Path., Natl. Inst. Hyg. Sci., Tokyo, Japan), M. Nakadate and S. Odashima. *Gann* 65(4):377, 1974.

The rapid and selective induction of erythroleukemia by 1-ethyl-1-nitrosourea (ENU) was studied in 36 female Donryu rats. At 11 weeks of age a 400-ppm solution of ENU was given continuously in the drinking water for seven weeks; thereafter it was given five days/week until the rats were killed. Erythroleukemia, diagnosed cytologically, developed in 97% of the treated rats. Survival time of the leukemic rats was 70-113 days, and anemia and hepatosplenomegaly were seen.

4334 LIVER ANGIOSARCOMA IN TWO WORKERS IN A PVC-PRODUCING FACTORY. *(Ger.)* Lange, C. E. (Univ. Derm. Clin., Bonn-Venusberg, W. Germany), S. Juehe, and G. Veltman. *Dtsch Med Wochenschr* 99(31): 1598-1599, 1974.

Two fatal cases of angiosarcoma of the liver following prolonged exposure to vinyl chloride in a PVC manufacturing plant are reported. Hemangioendothelial sarcoma of the liver was diagnosed in one 38-yr-old worker who worked in the PVC manufacturing plant for 12 yr. A blood sedimentation reaction of 22/67 mm, considerable anemia, reticulocytosis at the 6% level, serum iron level of 25 μg/100 ml, a gamma-globulin fraction of 25% rel. at 7.2 g/100 ml protein content, an alkaline phosphatase activity of 12 Bodansky U and a glutamic-oxalacetic transaminase activity of 24 mU/ml serum were measured. Bilaterally localized, multicentric, malignant primary angiosarcoma of the liver was diagnosed in another 39-yr-old patient who had been working in PVC production for 11 yr. In view of similar reports from other countries, as well as of related animal tests, the present findings indicate a possible causal relationship between such malignant tumors and exposure to vinyl chloride.

4335 A COMPARISON OF THE GENETIC ACTIVITY OF CHEMICAL MUTAGENS IN *SACCHAROMYCES CEREVISIAE* STRAINS D3, D4 AND D5 UTILIZING *IN VITRO* ASSAYS WITH AND WITHOUT HEPATIC ENZYME ACTIVATION. *(E.)* Brusick, D. (Howard Univ. Coll. Med., Washington, D.C.) and H. Andrews. *Mutat Res* 26(5):454, 1974.

4336 PHOSPHOLIPIDS IN RAT LUNGS DURING CHEMICAL CARCINOGENESIS. *(Rus.)* Blagorodov, S. G. (Rostov Res. Inst. Oncol., USSR), V. M. Poliakov and A. V. Arkhangelskaia. *Vopr Med Khim* 20(6):622-624, 1974.

4337 PHYTOHEMAGGLUTININ BLASTIC TRANSFORMATION IN CANCEROUS PATIENTS. *(Sp.)* Garcia-Puche, J. L. (Fac. Med., Granada, Spain), E. Munoz, F. Garrido and C. Osorio. *Sangre* 19(2):161-165, 1974.

4338 HISTOPATHOLOGIC CHANGES IN MICE FED 2-ACETYLAMINOFLUORENE (2-AAF) IN A CHRONIC STUDY. *(E.)* Frith, C. H. (Natl. Cent. Toxicol. Res., Jefferson, Arkansas) and W. E. Jaques. *Toxicol Appl Pharmacol* 29(1):106, 1974.

4339 INCORPORATION OF ^{3}H-LABELED ACROLEIN INTO RAT LIVER AND *Dunaliella bioculata*. *(Fr.)* Munsch, N. (Cancer Res. Inst., Villejuif, France), F. Marano and C. Frayssinet. *Biochimie* 56(10):1433-1436, 1974.

4340 THE CARCINOGENIC PROPERTIES OF THE HERBICIDE, 2,4-D AMINE. *(Rus.)* Arkhipov, G. N. (Inst. Nutr., Moscow, USSR) and I. N. Kozlova. *Vopr Pitan* (5):83-84, 1974.

4341 STUDIES ON THE EXCRETION OF AFLATOXIN AND ITS DERIVATIVES BY HUMANS. *(E.)* Merrill, Jr., A. H. (Virginia Polytech. Inst., Blacksburg), L. Salamat and T. C. Campbell. *Toxicol Appl Pharmacol* 29(1):94-95, 1974.

4342 EFFECT OF DDT PRETREATMENT OF DUCKLINGS ON THEIR SUBSEQUENT REACTION TO PEANUT CAKE CONTAMINATED WITH *Aspergillus flavus*. *(Fr.)* Ferrando, R. (Natl. Vet. Sch., Alfort, France), A. Lamine N'Diaye, N. Henry, C. Fourlon and F. Gautier. *C R Acad Sci [D] (Paris)* 279(13):1131-1134, 1974.

4343 INFLUENCE OF POLYCHLORINATED BIPHENOL (PCB) ON BIOCHEMICAL EFFECTS AND METABOLISM OF AFLATOXIN. *(E.)* Peters, E. L. (Food Drug Adm., Washington, D.C.), L. Friedman and K. G. Davis. *Toxicol Appl Pharmacol* 29(1):94, 1974.

4344 BIOCHEMICAL AND MORPHOLOGICAL CHANGES IN ALBINO-MICE WHICH WERE TREATED WITH ARSENIC TRIOXIDE. *(Ger.)* Basmadshijewa, K. (United Sci. Res. Inst. Hyg. Ind. Hyg., Sofia, Bulgaria) and K. Dawidkowa. *Z Gesamte Hyg* 20(9):586-588, 1974.

4345 THE UPTAKE AND METABOLISM OF BENZO(a)PYRENE BY PLANTS UNDER STERILE CONDITIONS. *(Rus.)* Durmishidze, S. V. (Inst. Plant Biochem., Tbilisi, USSR), T. V. Devdariani, L. K. Kavtaradze and L. Sh. Kvartskhava. *Dokl Akad Nauk SSSR* 218(6):1468-1471, 1974.

4346 SUSPENDED PARTICULATE MATTER AND BENZO(A)PYRENE IMMISSIONS. *(E.)* Waibel, M. (Dep. Hyg. Work Physiol., Swiss Inst. Technol., Zurich, Switzerland) and H. U. Wanner. *Experientia* 30:(11):1359-1362, 1974.

4347 MICROFILAMENTS IN EPIDERMAL CANCER CELLS. *(E.)* Malech, H. L. (Yale Univ. Sch. Med., New Haven, Conn.) and T. L. Lentz. *J Cell Biol* 60(2):473-482, 1974.

4348 ENERGY METABOLISM IN THE LUNGS OF OFFSPRING OF MICE GIVEN A COMBINATION OF 3,4-BENZPYRENE AND PHENOL. *(Rus.)* Vysochina, I. V. (A. N. Sysin Inst. Gen. Communal Hyg., Moscow, USSR), I. N. Konstantinova, L. F. Astakhova and N. N. Skvortsova. *Gig Sanit* (8):93-95, 1974.

4349 EFFECTS OF DIETHYLSTILBESTROL UPON THE MORPHOLOGY AND FUNCTION OF MOUSE TESTES IN RELATION TO LEYDIG CELL TUMORIGENESIS. *(E.)* Huseby, R. A. (Am. Med. Cent., Denver, Colo.) and S. A. McCormack. *J Steroid Biochem* 5(4):338, 1974.

50 EXPERIMENTAL STUDY OF HAEMATOTOXIC AND LEUKAEMOGENIC EFFECTS OF TRICHLOROPHONE AND
METHOATE. *(E.)* Stieglitz, R. (Med. Clin. I,
arite, Berlin, East Germany), W. Gibel, W. Werner
d H. Stobb. *Acta Haematol (Basel)* 52(2):70-76,
74.

51 EFFECTS OF ACTIVE OR PASSIVE IMMUNIZATION AGAINST OESTRADIOL-6-(O-CARBOXYMETHYL)
IME-BSA (E_2-6-BSA) ON 7,12-DIMETHYLBENZ-α-ANTHRA-
NE (DMBA) INDUCED MAMMARY CARCINOMA IN THE FEMALE
T. *(E.)* Hillier, S. G. (Tenovus Inst. Cancer Res.,
ath, Cardiff, Wales), G. V. Groom, A. R. Boyns and
H. D. Cameron. *J Steroid Biochem* 5(4):336, 1974.

52 HORMONAL INTERACTION ON ESTRADIOL RECEPTOR IN DIMETHYL-BENZ(A)ANTHRACENE-INDUCED
EAST TUMOURS. *(E.)* Leung, B. S. (Univ. Oregon
ed. Sch., Portland) and G. H. Sasaki. *J. Steroid*
ochem 5(4):336, 1974.

353 THERAPEUTIC EFFECTS OF AN AROMATIC RETINOIC ACID ANALOG ON CHEMICALLY INDUCED SKIN
APILLOMAS AND CARCINOMAS IN MICE. *(E.)* Bollag, W.
Dep. Exp. Med., F. Hoffmann-LaRoche & Co. Ltd.,
asel, Switzerland). *Eur J Cancer* 10(11):731-737,
974.

354 PROGESTERONE, DMBA AND CARCINOGENESIS.
(E.) Funder, J. W. (Prince Henry's Hosp.,
elbourne, Australia) and L. C. Minasian. *J Steroid*
iochem 5(4):336-337, 1974.

355 GLYCOSIDASES IN NORMAL AND DIMETHYLHYDRAZINE-TREATED RATS AND MICE WITH SPECIAL
EFERENCE TO THE COLONIC TUMOURS. *(E.)* Mian, N.
Sch. Med., Leeds, England) and D. M. Cowen. *Br J*
ancer 29(6):438-446, 1974.

356 THE INTERACTION OF FOREIGN CHEMICAL COMPOUNDS WITH THE GLUCURONIDATION OF ESTRO-
ENS *IN VITRO*. *(E.)* Heath, E. C. (Vanderbilt
niv. Sch. Med., Nashville, Tenn.) and J. V. Dingell.
rug Metab Dispos 2(6):556-565, 1974.

357 EFFECT OF JAWAHARENE AND MITOMYCIN C ON THE LIPID SYNTHESIS IN NORMAL MUSCLE AND
OUSE FIBROSARCOMA. *(E.)* Chaudhury, S. (Indian
Inst. Exp. Med., Calcutta, India) and D. K. Roy.
Indian J Cancer 11(3):285-288, 1974.

4358 METHYL-CHOLANTHRENE-INDUCED SARCOMATA IN MICE AFTER IMMUNISATION WITH *CORYNEBAC-*
TERIUM PARVUM PLUS SYNGENEIC SUBCELLULAR MEMBRANE
FRACTIONS. *(E.)* Baum, H. (Dep. Biochem., Chelsea
Coll., Univ. London, England) and M. Baum. *Lancet*
2(7893):1397-1398, 1974.

4359 UPTAKE OF NEUROTRANSMITTERS INTO SUBCELLULAR PARTICLES OF THE CAUDATE NUCLEUS. *(E.)* Matthaei, H. (Dept. Pharmacol., Univ. Würzburg, West Germany) and A. Philippu. *Naunyn Schmiedebergs Arch Pharmacol* 282:R63, 1974.

4360 NITROSAMINE-INDUCED CARCINOMA OF THE OESOPHAGUS. *(E.)* Deyasi, S. K. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India), B. K. Aikat and S. Sehgal. *Indian J Pathol Bacteriol* 17(3):180-186, 1974.

4361 THE DIFFERENT SUSCEPTIBILITY OF RAT LIVER LOBES TO CARBON TETRACHLORIDE AND DIMETHYLNITROSAMINE. *(E.)* Lawson, T. A. (Dep. Pathol., Univ. Queensland, Brisbane, Australia) and A. W. Pound. *Br J Exp Pathol* 55(6):583-588, 1974.

4362 STUDIES *IN VIVO* ON THE INHIBITION OF DIMETHYLNITROSAMINE METABOLISM IN THE RAT. *(E.)* Phillips, J. C. (British Ind. Biol. Res. Assoc., Carshalton, England), C. E. Heading, B. G. Lake, S. D. Gangolli and A. G. Lloyd. *Biochem Soc Trans* 2(5):885-888, 1974.

4363 STUDIES ON THE EFFECTS OF PHENOBARBITONE AND 20-METHYCHOLANTHRENE PRETREATMENTS ON THE METABOLISM AND TOXICITY OF DIMETHYLNITROSAMINE IN THE RAT. *(E.)* Lake, B. G. (Br. Ind. Biol. Res. Assoc., Carshalton, England), C. E. Heading, J. C. Phillips, S. D. Gangolli and A. G. Lloyd. *Biochem Soc Trans* 2(5):882-885, 1974.

4364 DYE-SENSITIZED PHOTOOXIDATION OF PHENANTHRENE. *(E.)* Dowty, B. J. (Dep. Biol. Sci., Chem., Louisiana State Univ., New Orleans), N.E. Brightwell, J. L. Laseter and G. W. Griffin. *Biochem Biophys Res Commun* 57(2):452-456, 1974.

4365 RAUWOLFIA DERIVATIVES AND BREAST CANCER. *(E.)* Saxén, E. A. (Dep. Pathol., Univ. Helsinki, Finland). *Lancet* 2(7884):833, 1974.

4366 COMBINED CHRONIC FEEDING AND THREE-GENERATION REPRODUCTION STUDY OF SODIUM SACCHARIN IN THE RAT. *(E.)* Taylor, J. M. (Food Drug Adm., Washington, D. C.) and L. Friedman. *Toxicol Appl Pharmacol* 29(1):154, 1974.

4367 FURTHER OBSERVATIONS ON THE METABOLISM OF SACCHARIN IN MAN. *(E.)* Byard, J. L. (Inst. Comp. Hum. Toxicol., Albany, N.Y.), E. W. Golberg and F. Coulston. *Toxicol Appl Pharmacol* 29(1):154-155, 1974.

4368 THE METABOLISM OF SAFROLE AND 2',3'-EPOXYSAFROLE IN THE RAT AND GUINEA PIG. *(E.)* Stillwell, W. G. (Baylor Coll. Med., Houston, Tex.), M. J. Carman, L. Bell and M. G. Horning. *Drug Metab Dispos* 2(6):489-498, 1974.

4369 ORAL EXFOLIATIVE CYTOLOGY IN REVERSE SMOKERS HAVING CARCINOMA OF HARD PALATE. *(E.)* Reddy, C. R. R. M. (Andhra Med. Coll., Visakhapatnom, India), V. R. Kameswari. *Acta Cytol (Baltimore)* 18(3):201-204, 1974.

4370 BIOLOGICAL AND BIOCHEMICAL STUDIES ON THIOACETAMIDE INDUCED HEPATOCARCINOGENESIS. *(E.)* Date, P. A. (Cancer Res. Inst., Bombay, India), S. V. Gothoskar, G. V. Talwalkar and S. V. Bhide. *Indian J Cancer* 11(3):296-300, 1974.

4371 HAEMOPERITONEUM COMPLICATING THOROTRAST-INDUCED HAEMANGIOENDOTHELIOMA OF THE LIVER. *(E.)* Campbell, I. W. (R. Infirm., Edinburgh, Scotland) and J. N. Webb. *J R Coll Surg Edinb* 19(4):233-237, 1974.

4372 COMPARISON OF THE CONTENT OF LIPID FRACTIONS AND THE INCORPORATION OF ^{32}P-ORTHOPHOSPHATE INTO INDIVIDUAL PHOSPHOLIPIDS IN EXPERIMENTAL LUNG TUMORS AND NORMAL LUNGS IN MICE. *(Rus.)* Pitsin, D. G. (Med. Acad., Sofia, Bulgaria) and P. V. Uzunov. *Vopr Med Khim* 20(3):254-257, 1974.

4373 INFRARED SPECTRA OF DNA FROM NORMAL & URETHAN TREATED MICE. *(E.)* Ranadive, D. V. (Cancer Res. Inst., Bombay, India), K. N. Arjungi and S. V. Bhide. *Indian J Biochem Biophys* 11(2):176-178, 1974.

See also:

* (Rev): 4201, 4202, 4203, 4204, 4205, 4206, 4207, 4208, 4209, 4223, 4232, 4234, 4235, 4236, 4237, 4238, 4239, 4240, 4241
* (Phys): 4378
* (Viral): 4389, 4390, 4464, 4469, 4510
* (Immun): 4554, 4575, 4579, 4587
* (Path): 4651
* (Epid-Biom): 4721, 4722, 4730

74 THE EFFECT OF IRRADIATED CELLS ON TUMOUR GROWTH. *(E.)* Bray, A. E. (Dep. crobiol., Univ. West. Australia). *Aust NZ J Surg* (4):424-426, 1974.

e effect on tumor growth of adding heavily irradia- d cells to a standard number of viable C57BL 6J use melanoma tumor cells before their inoculation to the syngeneic host was investigated. In the itial experiment, the latent period was 22 days r control animals and 12 days for 10 animals re- eiving admixed irradiated B16 melanoma cells and able cells. There was a 100% and 90% tumor inci- ence, resp. The growth rate of the melanoma s significantly increased if irradiated melanoma ells were mixed with the viable cells. This in- eased growth rate was directly dependent on the umber of irradiated cells added. There was no ignificant increase in growth rate until 5 X 10^5 rradiated cells were added to 1 X 10^4 viable cells. w doses of irradiated cells did not affect the rowth rate or tumor incidence. In a subsequent xperiment, the addition of irradiated B16 melanoma d Lewis lung tumor cells stimulated tumor growth, hereas the addition of MOPC myeloma cells decreased t. There was no significant difference observed fter the addition of C57 fibroblasts. These re- ults confirm the fact that irradiated B16 melanoma ells increase tumor growth and tumor incidence, s demonstrated in other experimental models. The nhibitory effect produced by irradiated BALB/c yeloma cells on B16 melanoma cells in C57Cl mice oes not support another study that found the ad- ition of irradiated WHT mouse ascites tumor and n undifferentiated carcinoma increased the tumor ncidence of CBA mammary tumor in CBA mice. The ifferences in H-2 antigenic compatibility between HT and CBA mice and C57 and BALB/c mice could xplain the differences between the two systems.

375 EFFECT OF SPLIT DOSES OF X RAYS ON NEOPLASTIC TRANSFORMATION OF SINGLE CELLS. *(E.)* orek, C. (Coll. Physicians Surg. Columbia Univ., ew York, N.Y.) and E. J. Hall. *Nature* 252(5483): 49-501, 1974.

Single and split radiation dosages were compared in their ability to produce neoplastic transformation in cultured cells. Primary or secondary cultures of hamster embryo cells were seeded at low density to allow for clone formation, and exposed to either a single 50 rad or 75 rad dose, or to two 25 rad or 37.5 rad doses, each five hr apart. The plates receiving the single large doses were exposed at a time midway between the ones exposed to the two smaller doses. Plates were fixed, stained, and examined for the presence of transformed clones. The plates given the 50 rad dose showed 0.19% transformation, while those given the two 25 rad doses showed a 0.35% transformation. Those given the 75 rad showed 0.62%, while those given the two 37.5 rad doses showed 1.08% transformation. The presence of feeder cells did not affect the proportion of cells transformed. More cells survived the split doses than the single ones, suggesting a correlation between the proportion of cells killed or transformed, even at the low doses used. It is concluded that split doses of radiation result in increased incidence of transformation.

4376 TUMOUR COLONY GROWTH IN THE IRRADIATED MOUSE LUNG. *(E.)* Thompson, S. C. (Med. Coll. St. Bartholomew's Hosp., London, England). *Br J Cancer* 30(4):337-341, 1974.

The effects of irradiation of lung tissue on colony size, after i.v. injection of spontaneous mammary tumor cell aggregates, were investigated with respect to length of effect, and whether single cell tumor suspensions would form colonies. C3H mice, 15 weeks old, were irradiated with approximately 7200 rad min^{-1} with a collinated beam to allow irradiation of all or either half of the thorax. The dose to the shielded half fell to less than 10% of the given dose 5 mm from the edge of the irradiated field. There were ten mice per group, except for mice injected 9 1/2 months after inoculation, when there were 18 per group. Mice were injected with either 1 x 10^6 single cells, or 1 x 10^5 aggregates (up to 20 cells/aggregate). Aggregates injected three hr after irradiation of the lungs with 2000 rad did not enhance colony forming efficiency, but those injected after 48 hr showed both increased efficiency and larger colonies. After 3 1/2 months, efficiency was still enhanced. Quantitation of tumor growth was impossible in the mice irradiated with 2000 rad 9 1/2 months before injection. When a 250 rad dose was used, stimulation of colony forming efficiency was not demonstrable until 9 1/2 months after irradiation. Stimulation of efficiency was always confined to the irradiated areas in each experiment. Injections of single cells did not give rise to colonies in any case. It is concluded that irradiation affects both number and growth rate of clonogenic cells, and relatively long-term effects can be demonstrated.

4377 TUMORIGENESIS IN DOGS EXPOSED TO PROLONGED LOW DOSES OF GAMMA RADIATION. *(Rus.)* Iakovleva, V. I. (No affiliation). *Kosm Biol Med* 8(6):20-25, 1974.

Studies were carried out on 150 dogs exposed to a continuous 22-hr daily radiation of Co^{60} in the doses of 21 rads (1st group), 63 rads (2nd group), and 125 rads (3rd group) per year; animals of the 4th and 5th groups were exposed continuously to 63 rads per year and an additional dose of 48+8+8 rads/day (4th group) and 42+42+42 rads/day (5th group) every 4 months. There were 36 controls. In the course of 6 years, patho-anatomical and histological studies of 74 experimental and 19 control dogs revealed 5 malignant and 5 benign tumors in the exposed animals. One animal from group 1 (6-year exposure; total dose 110 rad; 0.06 rad/day) had an eye melanoma which caused death. Multiple subpleural metastases were found in the lungs and the right adrenal gland. In group 3 (0.34 rads/day), 3 dogs had benign tumors in the thyroid gland, testes and subcutaneous connective tissue. In group 4, one dog (5-year exposure; total dose 600 rads) had an osteogenic rib sarcoma with metastases in the lymphatic nodes of the neck. The greater number of neoplasms was in group 5 with 3 malignant tumors of the total of 4 (bronchogenic lung cancer, 2.5-yr exposure--total dose 490 rad; hepatocellular liver cancer, 3.5 yr--600 rad; skin basal cell carcinoma, 6 yr--1,025 rad). In the controls, two dogs had tumors in the mammary glands. It was observed that continuous radiation induced tumors at a higher frequency in young animals (5-7 yr) than in older animals, in contrast to findings with spontaneous tumors.

4378 BASE PAIRING AND TEMPLATE SPECIFICITY DURING DEOXYRIBONUCLEIC ACID REPAIR SYNTHESIS IN HUMAN AND MOUSE CELLS.

(E.) Lieberman, M. W. (Natl. Cancer Inst., Bethesda, Md.) and M. C. Poirier. *Biochemistry* 13(26):5384-5388, 1974.

Nucleotide insertion during DNA repair synthesis was studied in cultured human diploid fibroblasts (WI-38) and Balb/c 3T3 mouse cells damaged with UV radiation and two mutagenic carcinogens N-acetoxy-2-acetylaminofluorene and 7-bromomethylbenz[a]anthracene. DNAs labeled during repair and replicative synthesis were prepared and subjected to thermal elution chromatography on hydroxylapatite. Data suggest that the nucleotides inserted during repair synthesis are base paired with those on the complementary, undamaged strand. Findings from S_1 nuclease digestion studies are in agreement with the data from thermal elution chromatography studies. DNA in repair patches behaves as double stranded DNA. The template specificity of repair synthesis in intact cells was examined by preparing pyrimidine isostich profiles. Mouse 3T3 cells were damaged with UV radiation (200 erg/mm^2; 254 nm) and DNA labeled during repair synthesis was separated into mainband and satellite DNA. The profile from satellite DNA labeled during repair synthesis closely resembled that from satellite DNA labeled during replicative synthesis. Similar results were seen for the mainband DNAs. These data suggest that repair synthesis is template directed and clearly rule out other models for repair synthesis such as random insertion, insertion of runs of a single nucleotide or insertion of runs of simple repeating units. The studies suggest that repair synthesis in response to three mutagenic and carcinogenic agents in two different mammalian cell lines results in accurate restoration of the damaged strand to the original nucleotide sequence. The studies demonstrate that repair synthesis in mammalian cells is not grossly inaccurate and represent a first step in evaluating the absolute template specificity of this process.

4379 FREQUENCY OF DIFFERENT HISTOLOGIC TYPES OF BRONCHOGENIC CARCINOMA AS RELATED TO RADIATION EXPOSURE.

(E.) Archer, V. E. (Natl. Inst. Occup. Saf. Health, Salt Lake City, Utah), G. Saccomanno and J. H. Jones. *Cancer* 34(6):2056-2060, 1974.

The frequency of different histologic types of bronchogenic carcinoma was investigated to determine whether or not there are types of bronchogenic cancer other than small cell unidifferentiated carcinoma which are increased among uranium miners. An earlier publication which used a life table method to obtain expected respiratory cancers among uranium miners by cumulative exposure groups through Sept. 1968 was extrapolated to Dec. 1970. Epidermoid, small cell undifferentiated and adenomatous types of bronchogenic carcinoma were all shown to be increased among uranium miners. This was done by use of calculations of expected numbers for each of the major histologic types. Small cell undifferentiated was the predominant type and was the only one that was significantly elevated in all cumulative radiation exposure groups. It was noted that the same three histologic types have been shown to be elevated among cigarette smokers, but with different relative frequencies. Other histologic types were not significantly elevated in frequency. An earlier finding that the frequency distribution of histologic types of bronchogenic cancer among uranium miners varied markedly with the radiation dose was shown to be an artifact resulting from dilution of radiogenic carcinomas by nonradiogenic carcinomas. Although absolute frequency of the different histologic types is dependent on magnitude of radiation exposure, the relative frequency appears to be independent. Small cell undifferentiated and epidermoid carcinomas of the lung appear to be closely related, and are the principal types whose frequency is increased by inhaled carcinogens, even though adenocarcinomas are also increased to some extent. The frequency of other histologic types is apparently unaffected by inhaled carcinogens in man. Thus, in any evaluation of histologic types of bronchogenic carcinoma, large cell should be separated from small cell undifferentiated types.

4380 NON-REPAIRABLE STRAND BREAKS INDUCED BY ^{125}I INCORPORATED INTO MAMMALIAN DNA.

(E.) Painter, R. B. (Lab. Radiobiol. Univ. California, San Francisco), B. R. Young and H. J. Burki. *Proc Natl Acad Sci USA* 71(12):4836-4838, 1974.

The relationship between unrepaired strand breaks induced by ^{125}I (as ^{125}I-labeled iododeoxyuridine) in DNA and cell killing was investigated in Chinese hamster V79 DNA. In the range of 0.6-15.2 X 10^4 disintegrations/cell, the overall mean yield of breaks was 4.3 breaks/decay. About 4 to 5 breaks are produced for each ^{125}I disintegration. In one series with greater numbers of disintegrations per cell (25-50 X 10^4 disintegrations/cell) the yield was about 2 breaks/disintegration. In three series of experiments at different dose rates, i.e., different numbers of disintegrations per cell per day, the cells that contained ^{125}I in their DNA failed to repair, on the average, about 1/2 of the single strand breaks induced by incorporated ^{125}I. In x-irradiated controls, repair of single strand breaks varied from 100% to about 70%. These observations contrast sharply with the effects of incorporated ^{3}H, which causes DNA strand breaks that are repaired to almost the same extent and at the same rate as those induced by x-irradiation. Thus, the extreme toxicity of ^{125}I when incorporated into DNA is correlated with the unrepaired breaks by decay of this isotope. These results suggest that unrepaired DNA strand breaks may be important in cell killing after treatments which damage DNA.

381 THOROTRAST-INDUCED LESIONS. *(Ger.)* Schwarz, E. (Mil. Clin., Novaggi, Swit-
erland) and U. Seiler. *Praxis* 63(6):149-156, 1974.

amage to tissues following Thorotrast injection has
een observed after latency periods of 6 to 40 yr.
his damage can occur at the injection site (thoro-
rastoma), or in organs of the reticulo-endothelial
ystem (RES) (dystrophy of the liver, fibrosis of
he spleen, atrophy of the bone marrow, or renal
irrhosis). Seven cases are reviewed. In 4 cases
he damage site was the RES. The initial injection
ites were in various parts of the body, ranging
rom a cerebral arteriography to an injection in
he left leg. Two of these patients had a cirrhotic liver
nd fibrosis of the spleen. One patient who had re-
eived a thorotrast injection in the lower left leg
29 yr before developed gastric adenocarcinoma. A
ase of the Thorotrast injection resulting in uremia
ue to hydronephrosis is reported, as well as 2 cases
f chronic subcutaneous tissue lesions following
emoral arteriographies.

4382 DIFFERENTIAL EFFECTS OF TOTAL-BODY PRE-IRRADIATION ON THE GROWTH AND METASTASIS OF LINE 1 ALVEOLAR CELL CARCINOMAS. *(E.)* Yuhas, J. M. (Oak Ridge Natl. Lab., Tenn.) and J. O. Proctor. *Radiat Res* 59(1):216, 1974.

4383 EFFECT OF RADIATION PENETRATION AND GROWTH STAGE OF HAIR FOLLCLES ON SKIN TUMOR INDUCTION. *(E.)* Albert, R. E. (New York Univ. Med. Cent., N.Y.), F. J. Burns and M. Vanderlaan. *Radiat Res* 59(1):17-18, 1974.

4384 BREAST CANCER AMONG JAPANESE ATOMIC BOMB SURVIVORS. *(E.)* McGregor, D. H. (Vet. Adm. Hosp., Kansas City, Mo.), K. Choi, P. I. Liu, S. Tokuoka and T. Wakabayashi. *Am J Clin Pathol* 62(2):308, 1974.

4385 STUDIES ON RADIATION-INDUCED MUTATION IN CULTURED SOMATIC MAMMALIAN CELLS *IN VITRO*. *(E.)* Suzuki, F. (Kanazawa Univ., Japan), S. Ban and M. Horikawa. *Radiat Res* 59(1):101, 1974.

4386 X-RAY-INDUCED MUTATIONS RESISTANT TO 8-AZAGUANINE IN SYNCHRONOUS CHINESE HAMSTER CELLS *IN VITRO*. *(E.)* Carver, J. H. (Dep. Radiol. Radiat. Biol., Colorado State Univ., Fort Collins) and W. C. Dewey. *Radiat Res* 59(1):101, 1974.

4387 CARCINOGENIC HAZARDS OF IRRADIATION DURING EMBRYONAL DEVELOPMENT IN MICE. *(E.)* Vesselinovitch, S. D. (Franklin McLean Mem. Res. Inst., Chicago, Ill.), E. Simmons, K. V. N. Rao and N. Mihailovich. *Radiat Res* 59(1):101-102, 1974.

4388 CRYPTOGENIC CELLS AND PROLIFERATIVE CELLS IN INTESTINAL EPITHELIUM. *(E.)* Hendry, J. H. (Christie Hosp., Manchester, England) and C. S. Potten. *Int J Radiat Biol* 25(6):583-588, 1974.

See also:

- * (Rev): 4210
- * (Chem): 4269, 4307
- * (Viral): 4495
- * (Immun): 4586
- * (Path): 4651

4389 *IN VITRO* CARCINOGENESIS STUDIES: DUAL EFFECT OF RNA TUMOR VIRUSES AND CARCINOGENIC CHEMICALS OR DNA VIRUSES. *(E.)* Rhim, J. S. (Microbiol. Assoc., Inc., Bethesda, Md.), R. J. Huebner, K. K. Takemoto and R. V. Gilden. *Bibl Haematol* (39): 635-648, 1973.

Rauscher leukemia virus (RLV)-infected Fischer rat embryo (RE) cells were treated with various carcinogenic chemicals for several days. Uninfected cells treated with chemicals and RLV-infected cells untreated with chemicals showed no evidence of transformation, while RLV-infected cells treated with diethylnitrosamine (DENA), 3-methylcholanthrene (3MC), 7,12-dimethylbenz(a)anthracene (DMBA), or benzo(a)pyrene (BP) were transformed. The transformed cells were more resistant to the toxicity of the chemicals than the untransformed RE cells. Local s.c. sarcomas were produced when the transformed cells were transplanted into newborn homotypic rats; the infected or chemically treated untransformed cells produced no tumors. When reestablished in tissue culture, cells derived from these sarcomas contained group-specific (gs) complement-fixing antigens characteristic of the murine leukemia-sarcoma virus complex and the C-type RNA particles. AKR virus-infected NIH Swiss mouse embryo cells, but not uninfected cells, were readily transformed by 3MC, DMBA, and BP. A rat embryo cell line infected with Rauscher leukemia virus, a Swiss mouse cell line infected with AKR wild C-type RNA virus, and an uninfected hamster embryo cell line were readily transformed on treatment with BP and produced tumors when injected into homologous hosts. Uninfected rat and mouse cells treated with BP and infected cells not treated with BP were not transformed and did not produce tumors *in vivo*. Transformation by DNA viruses (simian virus 40 and polyoma virus) was facilitated by the use of established rat cell lines rather than primary or secondary cultures, and transformation by DNA tumor viruses was further accelerated in rat cells chronically infected with a C-type RNA tumor virus. The results suggest that the C-type RNA virus genomes provide oncogenic determinants for chemical *in vitro* transformation and for DNA virus cell transformation.

4390 AN ELECTRON MICROSCOPIC STUDY OF SPONTANEOUS AND EXPERIMENTALLY INDUCED LEUKEMIA IN ICRC MICE. *(E.)* Hiraki, S. (M. D. Anderson Hosp. Tumor Inst., Houston, Tex.), K. J. Ranadive and L. Dmochowski. *Cancer Res* 34(3):474-483, 1974.

Spontaneous, serially transplanted, and experimentally induced leukemias of ICRC mice were studied by electron microscopy in an attempt to detect the presence of virus particles, if any, and to observe the influence of chemical and hormonal treatment on the presence of these virus particles. The first series of experiments included spontaneous, serially transplanted, and radiation-induced leukemia. Spontaneous leukemic lesions in the ICRC mice showed few or none of the type C virus particles seen in mice of high-leukemia strains. Serially transplanted and radiation-accelerated leukemic lesions showed the presence of some type C and intracisternal type A particles. In addition to type C virus particles, in two of these leukemic lesions (thymus and lymphosarcoma) budding and some mature type B virus particles and numerous intracytoplasmic type A particles were found. "Viropexis" of type B virus particles has been observed in the lymphosarcoma and in a leukemic thymus gland. The second series of experiments included leukemia induced in ovariectomized ICRC mice with 20-methylcholanthrene (MCA), pituitary transplants, and ovarian hormones (estradiol and estradiol-progesterone). In ovariectomized ICRC mice, leukemic lesions induced by MCA or pituitary transplants, or by MCA and pituitary transplants, showed type C virus particles and, in most cases, intracisternal type A particles. In leukemia induced in ovariectomized ICRC mice by MCA and estradiol, numerous intracytoplasmic type A particles were observed but no type C virus particles. Numerous intracytoplasmic type A particles, as well as budding and some type B virus particles were found in leukemia (thymus and spleen) induced in ovariectomized ICRC mice by MCA (8.0 mg total p.o. dose) and estradiol (1 μg) combined with progesterone (1.0 mg). The large dose of estradiol (10 μg) or a balanced dose of estradiol-progesterone may have stimulated the appearance of numerous intracytoplasmic type A particles, known to be precursors of mammary tumor virus.

4391 LOCALIZATION OF INTRACYTOPLASMIC A PARTICLES IN MOUSE TUMORS BY LIGHT MICROSCOPY. *(E.)* Tanaka, H. (Inst. Virus Res., Kyoto U., Japan), D. Tsumimura and K. Nakamura. *Cancer Res* 34(6): 1465-1474, 1974.

Two methods for identifying aggregates of intracytoplasmic A particles at the light microscopic level are described. The first is an immunofluorescent method using antisera against these particles. In DBA/2 mice mammary tumors examined both in sections and in smears, specific fluorescence was found in the form of discrete granules, confined to the cytoplasmic hemisphere proximal to the lumen. Neither nuclear nor diffuse cytoplasmic fluorescence was confirmed. All features of these fluorescing granules seem to justify their identification with A and B particles in various clusters. It is also shown that transplanted tumors contain more A particles with correspondingly fewer B particles than do spontaneous tumors. Specifically fluorescing granules were also observed in the cytoplasm of smears of mouse leukemia cells that were known to carry A particles. These granules were stained red by the second method described, with fuchsin acid and methylene blue as stains, and are referred to as inclusion bodies. Specificity of fuchsin acid staining was confirmed by a direct identification of inclusion bodies with specifically fluorescing granules in the same area of a smear. Because the staining is so simple and provides permanent preparations, it can be effectively used for studies on A particles in mouse leukemias.

4392 RNA SYNTHESIS SPECIFIC FOR AN INTEGRATED ADENOVIRUS GENOME DURING THE CELL CYCLE. *(E.)* Taube, S. E. (Yale U. Sch. Med., New Haven, Conn.), P. M. McGuire and L. D. Hodge. *Nature* 250(5465):416-418, 1974.

ltures of adenovirus type 2 (AD2-T)-transformed
t embryo cells were synchronized in the S phase
exposure to thymidine. The synthesis of cel-
lar and viral RNA was compared in cells progres-
ng from S phase, through G_2, and into metaphase;
e cells were exposed to ^{3}H-uridine for 1 hr in-
rvals during this period. Viral RNA synthesis cor-
sponded to total cellular RNA synthesis. The in-
rporation of ^{3}H-uridine into virus-specific RNA
s studied in known mixtures of metaphase and in-
erphase cells; incorporation decreased linearly
th increasing proportion of metaphase cells and
proached zero. This decrease paralleled that of
tal cellular RNA synthesis, suggesting that the
nthesis of both species is restricted to the same
tent during metaphase. Viral RNA was clearly
nthesized during the G_2 phase, and there was some
ncorporation of ^{3}H-uridine during G_1. The data
ndicate that the transformed state can be correlated
ith continuous functioning throughout interphase
f at least some portions of the integrated genome.

393 LOCATION OF THE ORIGIN OF DNA REPLICATION IN ADENOVIRUS TYPE 2.

(E.) Horwitz, M.
. (Albert Einstein Coll. Med., Bronx, N.Y.). *J*
irol 13(5):1046-1054, 1974.

tilizing the isolated left and right halves of both
denovirus type 2 and the nondefective adenovirus
imian virus 40 hybrid ($Ad2^+ND_1$), studies were under-
aken to find the site on the DNA molecules at which
eplication begins. The data are inconsistent with
eplication beginning at one end and progressing
simultaneously along both strands to the other end.
Internal initiation with bidirectional growth, as
occurs with the linear T7 bacteriophage DNA, was also
eliminated. The data are most consistent with bi-
directional replication starting at both ends of the
molecule. The data indicate that some of the simian
virus 40 sequences may be not only at the origin but
also at the terminus of DNA replication, suggesting
two alternate models of DNA replication. According
to one model, replication could begin on one strand
on the AT-rich right side, progressing in the 5' to
3' direction. Replication of the second strand is
delayed and could begin on the left hand after its
displacement from the replicating intermediate.
Replication of the second strand may also begin on
the parental 3' end of the template and progress on
the progeny strand in the 5' to 3' direction. It
is also possible that some molecules replicate both
strands simultaneously starting at the left end,
while other molecules have the equivalent replication
starting at the right end. A third possibility is
that similar sequences are incorporated to a limited
extent on both right and left halves.

4394 DUAL INFECTION OF HAMSTERS WITH ADENOVIRUS TYPE 12 AND TYPE 6.

(E.) Yabe, Y. (Okayama Univ. Med. Sch., Japan). *Gann* 65(4):331-335, 1974.

To study the etiological significance of adenoviruses isolated from human tumors or cancer patients, noninbred Syrian golden hamsters were inoculated i.p. at birth with adenovirus type 12 (ad-12, an oncogenic virus) and/or adenovirus type 6 (ad-6, a non-oncogenic virus); in some animals inoculated at birth with one virus, the other virus was injected after periods of two or more days. Most hamsters inoculated with 5 x $10^{3.5}$ TCD_{50} of ad-6 at birth died within three weeks; the death rate was reduced with doses of 5 x $10^{2.5}$, but most of the survivors showed growth retardation. The lethal and growth-retarding effects were greatly diminished when the animals were inoculated at two or more days of age, and were not influenced by the simultaneous inoculation of ad-12 at birth. Inoculation of ad-12 alone produced tumors in all animals surviving more than three weeks; simultaneous inoculation of ad-6 greatly reduced the tumor incidence. When ad-6 was inoculated four or more days after ad-12, no inhibition was observed. There was no histological difference in the tumors produced in animals inoculated with ad-12 alone or ad-12 plus ad-6. No virus was recovered from any of the tumors studied, although cytopathic agents were removed from the livers of four tumor-bearing hamsters inoculated with ad-12 and ad-6, 30-52 days previously. The isolated agents were identified as ad-6 by neutralization tests. Hamsters inoculated with both viruses had a high neutralizing antibody to ad-6 but not to ad-12, although those with tumors had varying titers of ad-12 tumor antibody. The results suggest that the inhibitory effect of ad-6 on ad-12 oncogenesis is due to its cytocidal effect on the target cells of ad-12 and that, once transformed by ad-12, the cells become resistant to this effect of ad-6.

4395 TRANSFORMATION CHARACTERISTICS OF TEMPERATURE-SENSITIVE MUTANTS OF TYPE 12 ADENOVIRUS.

(E.) Rubenstein, F. E. (Sch. Med., Univ. Pennsylvania, Philadelphia) and H. S. Ginsberg. *Intervirology* 3(3):170-174, 1974.

Three temperature-sensitive mutants of type 12 adenovirus (ts 303, ts 307, and ts 333) were isolated after mutagenesis of wild-type (Wt) virus with 5-bromo-2-deoxyuridine (BUdR). Each of the three mutants effectively complemented the other two, the complementation index for each double infection being 490 times greater than the sum of the yield of the two single infections. The complementation yield of ts 307 X ts 303 was 15.1% of Wt virus. Wt type 12 transforms primary rat embryo cells *in vitro*; ts 303 transformed at a frequency closely similar to Wt, ts 333 had diminished transforming effect at 32 C and essentially did not transform at 39.5 C, and ts 307 transformed cells at a slightly higher frequency than Wt virus at 32 C but consistently produced 2-4 times more transformed foci at 39.5 C. The increased transformation reduced by ts 307 at the nonpermissive temperature may be the result of a lesion in a regulatory viral gene which normally suppresses transformation. The transformed foci in each case readily produced continuous cell lines whose cells contained intranuclear T antigen. Preliminary studies indicate that ts 307 is a DNA minus mutant which induces the synthesis of T antigen but does not produce capsid proteins; ts 303 does not produce immunologically active hexon protein; and ts 333 makes reduced amounts of viral DNA and capsid proteins and produces large plaques at the permissive temperature.

4396 PURIFICATION OF AVIAN MYELOBLASTOSIS VIRUS DNA POLYMERASE BY AFFINITY CHROMATOGRAPHY ON POLYCYTIDYLATE-AGAROSE. *(E.)* Marcus, S. L. (Sloan-Kettering Inst. Cancer Res., Rye, N.Y.), M. J. Modak and L. F. Cavalieri. *J Virol* 14(4):853-859, 1974.

Polycytidylic acid [poly(rC)] covalently linked to cyanogen bromide-activated agarose is an effective affinity matrix for the RNA-dependent DNA polymerase from avian myeloblastosis virus (AMV). Poly(rC) is capable of binding large quantities of AMV DNA polymerase, which is then eluted using a linear KCl gradient of increasing concentrations. The DNA polymerase isolated from crude, detergent-disrupted virions by a single pass through poly(rC)-agarose columns appeared nearly homogeneous (approximately 90% pure) as determined by sodium dodecyl sulfate polyacrylamide disc gel electrophoresis. Complete recovery of input enzymatic activity was obtained. All the AMV isolated by affinity chromatography appeared as a single peak of activity corresponding to the PCH enzyme described by Grandgenett *et al.* Results suggest that polyribonucleotide columns may provide a high-yield, rapid method for purifying oncornaviral DNA polymerase.

4397 VISUALIZATION OF SINGLE-STRANDED NUCLEIC ACID OF RNA TUMOR VIRUS WITH THE ELECTRON MICROSCOPE. *(E.)* Weber, G. H. (Natl. Cancer Inst., Bethesda, Md.), U. Heine, M. Cottler-Fox and G. S. Beaudreau. *Proc Natl Acad Sci USA* 71(5):1887-1890, 1974.

60-70S RNA of avian myeloblastosis virus was spread according to the Kleinschmidt method and examined under the electron microscope after being subjected to a variety of denaturing conditions. Dilution of the RNA with only 4 or 8 M urea had no noticeable effect on the configuration of the collapsed molecule. Extension of the molecules from the collapsed configuration occurred only under the combined denaturing effects of both urea (8 M) and 80% formamide. Fully extended molecules were observed with approximately 4 M urea and 80% formamide. The longest molecules (1-2 μm) were observed under the most stringent denaturing conditions. To determine if spreading led to disruption of covalent bonds, nonsegmented RNA from vesicular stomatitis virus and Newcastle disease virus were spread in the presence of urea and formamide. Measured lengths of the RNAs corresponded closely to their molecular wt. Thus, AMV 60-70S RNA is not a linear covalently-bonded molecule of 8-10 μm. The true length of the intact viral genome may still be unknown, however, since methods used to extend the molecule for length determination may irreversibly disrupt the genome.

4398 VIRUS RELEASE BY CELL COLONIES DERIVED FROM CHICKENS AND CULTURES INFECTED WITH AVIAN MYELOBLASTOSIS VIRUS. *(E.)* Dodge, W. H. (Project Strengthen Res. Lab., Winston-Salem State U., N.C.). *Cancer Res* 34(8):1822-1826, 1974.

More than 90% of 3-wk-old clones obtained from avian myeloblastosis virus (AMV)-induced myeloblasts differentiate into mature cells when grown as colonies in semisolid medium. These colonies were also seeded onto susceptible cell feeder layers to assay for the presence of transforming AMV. No correlation was found between the presence or absence of virus and the degree of differentiation of the colony. Of 131 myeloblast colonies placed on susceptible cell feeder layers, 121 were found to produce proliferating myeloblasts. The 10 negative colonies were also negative for AMV. Myeloblastosis-associated viruses, however, were recovered from all 10. Of 102 myeloblast-positive colonies tested, 84 produced transforming AMV as well as associated viruses. The remaining 18 released no AMV although myeloblastosis-associated viruses were recovered in each case. In summary, most clones were myeloblast positive and AMV positive. Approximately 18%, however, were myeloblast positive and AMV negative, and approximately 8% were myeloblast negative and AMV negative. Normal colony-forming cells were often present in leukemic buffy coats. They did not release AMV and did not contain myeloblasts although myeloblastosis-associated viruses were released.

4399 ERRORS IN DNA REPLICATION AS A BASIS OF MALIGNANT CHANGES. *(E.)* Loeb, L. A. (Fox Chase Ctr. Cancer Med. Sci., Philadelphia, Pa.), C. F. Springgate and N. Battula. *Cancer Res* 34(9):2311-2321, 1974.

Possible relationships between errors in DNA replication and malignant progression were investigated. Theoretical and experimental studies designed to determine the energy of interaction between different nucleotides were reviewed. The difference in the energy of interaction between complementary and noncomplementary base pairs (1 to 3 kcal) is not sufficient to account for the exactness of DNA replication that is observed *in vivo* or *in vitro*. Thus, DNA polymerases must play a role in base selection. This point has been established by the detection of polymerases that copy polynucleotide templates with few errors and the detection of others that make many errors. Different mechanisms for base selection by polymerases have been considered. Findings that both extracts of human leukemic lymphocytes and a purified DNA polymerase from avian myeloblastosis virus have exceptionally high error rates were considered in relationship to oncogenesis. A hypothesis is presented that related mistakes in DNA replication, as promoted by error-prone DNA polymerases, to tumor progression. A more general concept encompassing early cellular changes that lead to oncogenesis was also considered. Both of these hypotheses are open to immediate experimental analysis.

4400 MICROMORPHOLOGY OF RIBOSOME-LIKE STRUCTURES ISOLATED FROM AVIAN MYELOBLASTOSIS VIRUS. *(E.)* Korb, J. (Inst. Organic Chem. Biochem., Czechoslovak Acad. Sci., Prague) and J. Riman. *Acta Virol (Praha)* 18(1):1-9, 1974.

The structure and size of "ribosomes" isolated from avian myeloblastosis virus (AMV) and cytoplasmic ribosomes (CR) from the host cell, the avian leukemic myeloblast, were compared electron microscop-

cally. In shadowed and negatively stained prepara-
ions, particles isolated from purified AMV
howed the presence of a typical subunit structure;
his structure was identical to that of the CR of the
ost cell. In addition to these particles, which oc-
urred in approximately 20% of the negatively stained
reparations, compact particles were found in approxi-
ately 60% of the preparations and partially disrupted
ormations were found occasionally. The essential dif-
erence between the viral "ribosomes" (VR) and the CR
ay in their size. Whereas the dimensions of the CR of
he leukemic myeloblast were 238 X 185 Å (length X
idth), the unfixed viral ribosomes contained two types
f particles measuring 299 X 259 Å and 423 X 344 Å. The
istribution of these two types was not constant and
aried with viral pellets isolated from different
ools of the leukemic plasma. The smaller particles
ay represent premature particles and the larger
articles an even earlier stage of maturation. The
ixation of the myeloblastic and viral ribosomes
id not lead to observable changes in their structure.

4401 THE POSSIBLE CORRELATION OF GROWTH RATE AND EXPRESSION OF TRANSFORMATION WITH TEMPERATURE-DEPENDENT MODIFICATION IN HIGH-MOLECULAR-WEIGHT MEMBRANE GLYCOPROTEINS IN MAMMALIAN CELLS TRANSFORMED BY A WILD-TYPE AND BY A THERMOSENSITIVE MUTANT OF AVIAN SARCOMA VIRUS. *(E.)* Reiber, M. (Venezuelan Inst. Sci. Invest., Cent. Microbiol. Cell Biol., Caracas) and J. C. Irwin. *Cancer Res* 34(2): 3469-3473, 1974.

Sodium dodecyl sulfate-polyacrylamide gel electrophoresis was used to study the plasma membrane fractions of normal rat kidney cells transformed by a temperature-sensitive derivative of Rous sarcoma virus (NT$_3$-KR). The ts-NT$_3$-KR cells showed the transformed morphology at 33 C and the untransformed phenotype at 37 C, as well as a temperature-dependent growth in agar. Over 20 protein components were contained in the plasma membrane fractions of the cells grown at both 33 and 37 C. However, a selective increase in a protein with an apparent molecular wt of about 48,000 was evident in cells in which the transformed phenotype was expressed at 33 C. In addition, a 250,000-molecular wt glycoprotein component present in preparations from the cells grown at 37 C was diminished or absent in the plasma membranes isolated from the cells grown at 33 C. A similar study of normal rat kidney cells transformed by the wild-type avian virus revealed no temperature-mediated differences in the morphology or transformed properties of the cells grown at 33 and 37 C. However, there was a marked decrease in a 250,000-molecular wt protein in the cells grown at 37 C compared with those grown at 33 C. These cells showed more rapid growth and tended to reach a higher saturation density at 37 C compared with 33 C. Thus, the changes in glycoprotein content appear to depend on the growth rate of the transformed cells as well as on the expression of transformation.

4402 USE OF DNA-DNA ANNEALING TO DETECT NEW VIRUS-SPECIFIC DNA SEQUENCES IN CHICK EMBRYO FIBROBLASTS AFTER INFECTION BY AVIAN SARCOMA VIRUS. *(E.)* Varmus, H. (Dep. Microbiol, Univ. California, San Francisco, Calif.), S. Heasley and J. M. Bishop. *J Virol* 14(4):895-903, 1974.

Labeled, virus-specific DNA synthesized *in vitro* by the virion-associated polymerase of avian sarcoma virus (ASV) was used to measure virus-specific sequences in cell DNA in three ways: by determining the effect of cell DNA on the reassociation rate of double-stranded polymerase products; by measuring the kinetics of annealing of single-stranded polymerase product (cDNA) to cell DNA; or by measuring the amount of cDNA which anneals to a large excess of cell DNA. Fewer than five copies of ASV-specific DNA sequences were present per diploid cell in uninfected chick embryos; following ASV infection, the copy number of viral DNA increased by a factor of about two to four. Infection also introduced cell viral sequences that were not present before infection: after prior annealing to chick embryo DNA, as much as 45-50% of the cDNA from the B77 strain of ASV became nuclease resistant when subjected to repeated incubations with additional chick embryo DNA. A considerable proportion of the unannealed B77 cDNA was capable of interacting with DNA from B77-transformed chick cells. Similar results obtained with SR-ASV DNA and B77 cDNA indicate that some of the new viral sequences are shared by both virus strains. Assay of the effect of cell DNA on the reassociation kinetics of B77 srDNA revealed that DNAs from uninfected Pekin duck and Japanese quail embryos have no homology with DNA synthesized by the ASV polymerase. No copies of viral sequences were detected in quail or duck cells using either fractionation on hydroxyapatite or resistance to S1 nuclease as a measure of reassociation. The differences between these results and those previously reported are discussed together with the merits of the various DNA-DNA annealing techniques.

4403 ISOLATION FROM BALB/c MOUSE CELLS OF A STRUCTURAL POLYPEPTIDE OF A THIRD ENDOGENOUS TYPE C VIRUS. *(E.)* Stephenson, J. R. (Natl. Cancer Inst., Bethesda, Md.), S. R. Tronick and S. A. Aaronson. *Cell* 3(4):347-353, 1974.

A 12,000 molecular wt type-C viral polypeptide, p12, isolated from BALB/c mouse cells was immunologically distinct from the p12 antigens of BALB:virus-1 and BALB:virus-2. It was, however, indistinguishable from a viral antigen expressed in NIH Swiss mouse cells and present in type C viruses isolated from NIH Swiss mice. Both antigens reacted strongly in R-MuLV and group-specific assays for p12, but poorly in the AKR-MuLV p12 immunoassay. The p12 antigen of BALB:virus-1 reacted strongly in AKR-MuLV type-specific and MuLV group-specific p12 immunoassays, whereas the p12 antigen of BALB:virus-2 reacted well only in the MuLV group-specific assay. The new viral p12 antigen in BALB/c cells is assumed to represent the partial expression of a third distinct endogenous virus. The expression of endogenous viruses containing each of three distinguishable p12 antigens was differentially affected by two classes of chemical inducers: halogenated pyrimidines and inhibitors of protein synthesis. BALB:virus-1 was efficiently activated by iododeoxyuridine but was not detectably induced by cycloheximide. BALB:virus-2 was induced at similar high frequencies by both drugs; it is also the only virus spontaneously released at detectable levels from embryo cells. The virus that was partially expressed in BALB/c cells was not activated spontaneously or by chemicals in either NIH Swiss or BALB/c embryo cells. This implies a very tight cellular restriction of the complete expression of this virus. These findings indicate the BALB/c cells contain genetic information of three distinguishable viruses.

4404 EFFECT OF MITOTIC INHIBITORS ON C-TYPE VIRION PRODUCTION. *(E.)* Hino, S. (Inst. Med. Sci., Univ. Tokyo, Japan) and T. Yamamoto. *Japan J Exp Med* 44(1):55-62, 1974.

The effect of mitotic inhibitors on the replication of C-type virus was studied to determine the possible relationship between the growth of these particles and the microtubular protein. By treating Friend leukemia virus-producing C3H2K cells with Colcemid or Vinblastin, the amount of tritiated uridine incorporated into the virions was reduced to 1/2 to 1/4 that of the controls; but the incorporation of tritiated uridine into the cells or macromolecular cellular fractions was not inhibited. The inhibition of the incorporation into the virions was reversed by the removal of mitotic inhibitors, indicating that the inhibition was not due to nonspecific cellular damage. The inhibition appeared within 1 hr and the rate of inhibition was not related to the increase of the cell population in mitotic arrest. This indicates that the inhibition was due to a different mechanism than that involved in the mitotic arrest of the cells. Direct binding of colchicine, a derivative of Colcemid, to the virions or viral subunits was not observed. These data did not support any relationship between viral assembly and cellular microtubular protein.

4405 NATURAL EXPRESSION OF FELINE TYPE-C VIRUS GENOMES. PREVALENCE OF DETECTABLE FeLV AND RD-114 GS ANTIGEN, TYPE-C PARTICLES AND INFECTIOUS VIRUS IN POSTNATAL AND FETAL CATS. *(E.)* Cardner, M. B. (Univ. South. California Sch. Med., Los Angeles), S. Rasheed, R. W. Rongey, H. P. Charman, B. Alena, R. V. Gilden and R. J. Huebner. *Int J Cancer* 14(1):97-105, 1974.

The group-specific (gs) antigen of RD-114, an endogenous type C virus of domestic cats, was detected by complement fixation (CF) in two of 100 fetal cats and was not detected in any tumors or spleens of postnatal cats. RD-114 was isolated *in vitro* in RD human sarcoma cells from two of 31 normal cat fetuses but not from any postnatal cat tumors or, with one exception, spleens. Feline leukemia virus (FeLV) gs antigen was detected by CF and type-C particles were seen by electron microscopy in high prevalence in young cats with lymphoma (65%), anemia (75%), and infectious peritonitis (25%). FeLV gs antigen, type-C particles, and infectious FeLV were occasionally (10-20%) found in cat fetuses. The general absence of FeLV gs antigen in the endometrium of pregnant cats and the low prevalence of detectable FeLV gs antigen in cat fetuses suggest that the epigenetic transplacental spread of infectious FeLV is not a common occurrence in domestic cats. However, the isolation of FeLV from two pairs of fetal littermates and from the endometria and spleens of both mother cats indicates that such an epigenetic transmission of FeLV can occur. There was an excellent correlation between detection of RD-114 or FeLV gs antigen in fetal and postnatal tissues and the subsequent *in vitro* isolation of the corresponding virus. FeLV gs antigen, type-C particles, and infectious virus were seldom found in lymphoma- and carcinoma-bearing rats over 10 yr of age. RD-114 and FeLV gs antigens or infectious virus were never detected in the same tissues, the same cat, or the same litter. These findings are discussed in relation to the natural history of these two different feline type-C virus genomes.

4406 ULTRASTRUCTURAL STUDIES OF CELL-VIRUS INTERACTION IN REPTILIAN CELL LINES. II. DISTRIBUTION, INCIDENCE, AND FACTORS ENHANCING THE PRODUCTION OF INTRAMITOCHONDRIAL VIRIONS. *(E.)* Lunger, P. D. (Dept. Biol. Sci., U. Delaware, Newark) and H. F. Clark. *J Natl Cancer Inst* 53(2):533-540, 1974.

Intramitochondrial virions (IMV) of identical morphology were observed by thin-section electron microscopy in three reptilian cell lines: VSW, VH-2, and GL-1. Two factors, supraoptimal incubation temperatures and rhabdovirus superinfection, significantly enhanced the production of these particles in VSW cells. Moderate enhancement of IMV in VH-2 cells was achieved by higher incubation temperature; IMV incidence in VH-2 and GL-1 cell lines was somewhat increased by incubation with a supernatant harvested from a spleen cell culture derived from a corn snake bearing type C virus-producing sarcoma.

4407 SEARCH FOR ONCOGENICITY OF TYPE C PARTICLES FROM MAMMALIAN CELL LINES TRANSFORMED BY AVIAN ONCORNAVIRUSES. *(E.)* Smida, J. (Cancer Res. Inst., Slovak Acad. Sci., Bratislava, Czechoslovakia), V. Smidova, A. Andrese and G. F. V. Woude. *Neoplasma* 21(6):609-618, 1974.

Studies were undertaken to characterize type C particles released from virogenic rat and hamster cell lines transformed by the nondefective avian sarcoma viruses Bratislava 77 (B77V) and Schmidt-Ruppin strain of Rous sarcoma virus (SR-RSV). Three clonal cell lines (BR cl 14, PB cl 3, and SR cl 18) derived from Wistar rat embryo cells transformed by B77V or SR-RSV and one line (SH cl 12) from Syrian golden hamster cells infected with SR-RSV were used. Culture fluids were centrifuged out, examined by electron microscopy, assayed for reverse transcriptase activity, and tested for oncogenicity in secondary chick, quail, and duck embryo cells. Type C particles were detected by electron microscopy in the virogenic BR cl 14, SR cl 18, and Sh cl 12 lines, but were not found in the nonvirogenic PB cl 3 line. Reverse transcriptase assay showed C particle yield was low compared with production of B77V and SR-RSV by transformed permissive embryo cells. No activity could be detected in culture fluids from the PB cl 3 cells. The type C particles released from the virogenic cell lines did not transform avian test cultures and did not replicate on chick, quail, and duck cells. It is concluded that the particles may belong to a type of mammalian endogenous virus.

08 TYPE C VIRAL ANTIGENS IN MAN. I. ANTIGENS
RELATED TO ENDOGENOUS PRIMATE VIRUS IN HU-
N TUMORS. *(E.)* Sherr, C. J. (Natl. Cancer Inst.,
thesda, Md.) and G. J. Todaro. *Proc Natl Acad Sci*
4 71(12):4703-4707, 1974.

rtially purfied extracts from 33 human tumors of
veral histologic types were used as competing anti-
ns in a radioimmunoassay for the p30 protein of an
dogenous baboon type C virus (M7). Antigens immuno-
gically related to the M7 p30 protein were detected
two tumors, a lymphocytic lymphoma and an ovarian
rcinoma. These tumors contained 18 and 8 ng of
tigen/tissue protein, resp. Like viral 30 antigens
eviously identified in tissues of other primates,
e antigens in the human tumors cross reacted with
e p30 protein of the feline RD-114 virus but were
related by similar immunologic criteria to the p30
otein of other mammalian type C viruses (Rauscher
rine leukemia virus, feline leukemia virus, and
olly monkey type C virus). Gel filtration showed
at most of the antigenic activity co-chromatographed
ith authentic p30 protein. Previous studies have
emonstrated the presence in human cellular DNA of
ucleic acid sequences related to those of an endo-
enous primate type C virus. Together with this find-
ng, the present results indicate that humans, like
ther primates, have type C viral sequences in their
enome and can, in some circumstances, express at
east one type C viral protein.

409 ONCOGENICITY OF THE R-35 RAT MAMMARY TU-
MOR VIRUS. *(E.)* Bogden, A. E. (Dep.
mmunobiol, Mason Res. Inst., Worcester, Mass.), W.
. Cobb, M. Ahmed, S. Alex and M. M. Mason. *J Natl*
ancer Inst 53(4):1073-1077, 1974.

-35 mammary tumor virus (R-35MTV), a C-type rat vi-
rus originally isolated from the R-35 mammary adeno-
carcinoma, was inoculated s.c. into Sprague-Dawley-
derived GFRC:SPF(SD) male and female neonates to de-
termine its oncogenic potential in the species of
origin. Over a 20-month observation period, tumors
developed in 49 of 166 (29.5%) virus-inoculated fe-
males and 20 of 108 (18.5%) control females. Al-
though benign tumor incidence was similar in control
(16.7%) and virus-inoculated rats (18.7%), malignant
tumor incidence in the virus-inoculated group (10.8%)
was six times greater than in controls (1.8%). Ma-
lignant tumors (mammary carcinomas or adenocarcinomas)
also appeared earlier (4-5 months of age) in virus-
treated than in control (9-13 months) animals. Es-
trogen imbalance, induced by s.c. implantation of
17β-estradiol pellets, was associated with mammary
tumor development in seven of 20 virus-inoculated
animals over a 13-month period; no tumors appeared
in the 21 controls during this period. Electron
microscopy and fluorescent-antibody studies on eight
tumors from virus-inoculated rats revealed that all
were positive for R-35MTV antigen and three for C-
type particles. Five primary tumors from controls
were negative for both R-35MTV antigens and C-type
particles. None of the 315 virus-inoculated and
247 control animals, of either sex, developed leu-
kemia. Although a C-type virus, R-35MTV given neona-
tally is apparently associated with an increased incidence of mammary neoplasms of epithelial rather than of connective tissue origin.

4410 ACQUISITION OF MALIGNANT PROPERTIES BY SV40-TRANSFORMED MOUSE CELLS: RELATIONSHIP TO TYPE-C VIRAL ANTIGEN EXPRESSION. *(E.)* Tevethia, S. S. (Tufts Univ. Sch. Med., Boston, Mass.) and V. L. McMillan. *Intervirology* 3(4):269-276, 1974.

Tumorigenic and non-tumorigenic simian virus 40 (SV-40)-transformed cells were studied to determine whether they had different levels of type-C virus expression. BALB/c mouse embryo cells were cultured and infected with the Baylor strain of SV40. Transformed cells at various *in vitro* passage levels (8, 24, 36, 48, 59) were inoculated into syngeneic adult male mice, normal or immunosuppressed with antilymphocyte serum; or into either normal or immunosuppressed newborn mice. The cells were found to induce tumors in all animals, but only at the 59 passage level. The tumors were transplantable to adult immunologically competent animals, and contained in their cellular nuclei SV40 tumor antigen. Indirect immunofluorescent testing showed that murine leukemia virus group-specific antigen was not present in transformed cells passaged *in vitro* but was present in tumor cells in the 4th and 5th *in vivo* passages. It is concluded that prolonged *in vitro* cultivation of SV40-transformed mouse cells is required to produce tumors, even in an immunosuppressed syngeneic host, and that murine leukemia virus group-specific antigen is independent of transplantability of transformed cells.

4411 INFECTION OF EBV-GENOME-NEGATIVE AND -POSITIVE HUMAN LYMPHOBLASTOID CELL LINES WITH BIOLOGICALLY DIFFERENT PREPARATIONS OF EBV. *(E.)* Klein, G. (Dep. Tumor Biol., Karolinska Inst., Stockholm, Sweden), B. Sugden, W. Leibold and J. Menezes. *Intervirology* 3(4):232-244, 1974.

Differences between the P3HR-1 and B95-8 strains of Epstein Barr virus were investigated by comparing their effects on a cell line, BJA-B, from an EBV-genome-negative African Burkitt lymphoma patient with the effects on other cell lines. The BJA-B-1, 698, 715, and K-562 lines [lacking detectable EBV-DNA and EBV-associated nuclear antigen (EBNA)] and the Raji line (EBV genome-carrying) were infected and harvested in parallel with uninfected controls. Direct immunofluorescence testing 1 hr after infection showed Raji cells have more virus receptors than the BJA-B cells. None of the other lines showed any appreciable adsorptive capacity. P3HR-1 virus was found to induce both early antigen and EBNA in the BJA-B cells. In the Raji cells, early antigen induction was lower, and the EBNA could not be determined. The B95-8 virus did not induce early antigen in either BJA-B or Raji cells, but did induce EBNA in the BJA-B cells. It is concluded that lack of EBV receptors or other intracellular mechanisms do not account for failure of Burkitt lymphoma tumors to pick up EBV genome, and that responses of BJA-B to the two viral strains are either qualitatively or quantitatively different.

4412 A SEROLOGICAL STUDY OF ANTIBODY TO EPSTEIN-BARR VIRUS IN AN AUSTRALIAN POPULATION. *(E.)* McKinnon, G. T. (Fairfield Hosp. Commun. Dis., Melbourne, Australia) and R. C. Pringle. *Med J Aust* 2(7):243-246, 1974.

The incidence of antibody to Epstein-Barr virus (EBV) was determined in 687 sera from inhabitants of Melbourne, Australia. The presence of antibody in five of 10 infants under 3 months of age indicates transplacental passage of maternal antibody, the incidence being that which would be expected in their mothers (i.e., 59-66% in women aged 15-39 yr). Four of nine children between 3 and 11 months of age were positive for antibody to EBV, this group including both subjects with persistent maternal antibody and those who had developed their own antibody after exposure to EBV. Over 1/3 (23 of 65 cases) of the children aged 1-4 yr were positive for EBV antibody; in all cases this was assumed to be of the child's own making. This reflected the highest rate of antibody development in any age group. The age incidence then rose slowly and regularly, without any abrupt changes in rate, to a maximum of 79% in subjects aged 40-49 yr. A fall in incidence to 58% in the 50+ yr age group may reflect a decline in the serum antibody levels to below the levels detectable in the study.

4413 DIRECT EVIDENCE FOR THE PRESENCE OF EPSTEIN-BARR VIRUS DNA AND NUCLEAR ANTIGEN IN MALIGNANT EPITHELIAL CELLS FROM PATIENTS WITH POORLY DIFFERENTIATED CARCINOMA OF THE NASOPHARYNX. *(E.)* Klein, G. (Karolinska Inst., Stockholm, Sweden), B. C. Giovanella, T. Lindahl, P. J. Fialkow, S. Singh and J. S. Stehlin. *Proc Natl Acad Sci USA* 71(12): 4737-4741, 1974.

A well-differentiated squamous cell carcinoma and three poorly differentiated carcinomas of the nasopharynx were analyzed for the presence of Epstein-Barr virus (EBV) DNA by hybridization with radioactive complementary RNA. The well-differentiated carcinoma contained no detectable EBV DNA, whereas the three anaplastic carcinomas contained 41, 16, and 14 viral genome equivalents/cell. The anaplastic carcinomas were heavily infiltrated with lymphocytes and other nonneoplastic cells. All four tumors were successfully passaged in nude mice with thymic aplasia. Mouse cell admixture in the heterotransplanted tumors was estimated by analysis of glucose-6-phosphate dehydrogenase and varied between 25-80%. After two passages in nude mice, the squamous cell carcinoma remained negative for EBV DNA, while the three anaplastic carcinomas retained their viral DNA. After correction for mouse cell admixture, the latter tumors were found to contain 80, 55, and 160 EBV genome equivalents/human cell. The virus-determined nuclear antigen was localized in large carcinoma cell clusters in all three EBV-positive, mouse-passaged tumors; other virus-determined antigens were not detected, indicating the absence of virus induction. In contrast to the original tumor biopsies, the mouse-passaged tumors showed virtually no lymphocytic infiltration. It is concluded that EBV DNA in human nasopharyngeal carcinoma is localized in the neoplastic cells.

4414 ANTIBODIES TO EPSTEIN-BARR VIRUS (EBV) ANTIGENS IN SERA OF AMERICAN BURKITT LYMPHOMA PATIENTS. *(E.)* Ablashi, D. V. (Frederick Cancer Res. Cent., Md.), G. B. De-The, J. M. Easton, A. Liabeuf, P. H. Levine and G. R. Armstrong. *Biomedicine* 20(4):288-293, 1974.

Twenty-five sera from 21 patients with American Burkitt lymphoma were assayed for antibodies to four different Epstein-Barr virus (EBC) antigens: viral capsid antigen (VCA), particulate complement-fixing antigen (CF), early antigen (EA) (15 sera only), and nuclear antigen (NA). Geometric mean titers (GMT) of all four antigens were higher in patient sera than in sera from 10 controls. In the case of NA, the GMT of the American Burkitt sera was 59, while that of the controls was 1.5. Antibody levels were significantly higher in patients aged 21-27 yr than in other age groups. Although 11 of 25 sera from lymphoma patients had negative titers for one or more antibodies, none of 15 sera were negative for all four antibodies. The data suggest a possible relationship between EBV and American Burkitt lymphoma.

4415 *IN SITU* LOCALIZATION OF GLOBIN MESSENGER RNA FORMATION. II. AFTER TREATMENT OF FRIEND VIRUS-TRANSFORMED MOUSE CELLS WITH DIMETHYL SULFOXIDE. *(E.)* Conkie, D. (Beatson Inst. Cancer Res., Glasgow, Scotland), N. Affara, P. R. Harrison, J. Paul and K. Jones. *J Cell Biol* 63(2):414-419, 1974.

Globin messenger RNA (mRNA) in Friend virus-transformed mouse cells was estimated by *in situ* hybridization of DNA copy (cDNA) to fixed preparations of cells and by hybridization of cDNA to extracted cytoplasmic RNA in true solution. Results obtained by both methods showed that untreated Friend cells contained a small amount of globin mRNA. The globin mRNA content increased in dimethyl sulfoxide (DMSO)-treated Friend cells, reaching a maximum of 8.7% in cells treated for about four days with DMSO. The proportion of hemoglobinized Friend cells also increased sharply in DMSO-treated cells, reaching a maximum of 85% after culture in DMSO for five to six days. A minimum of three days in DMSO was required for cells to become hemoglobinized, and this period coincided with a 10-fold increase in cytoplasmic globin mRNA levels. Bromodeoxyuridine prevented both hemoglobin and globin mRNA accumulation. Results indicate that there is some globin mRNA synthesis in untreated Friend cells. Further experiments are required to elucidate the mechanism whereby this constitutive level of synthesis globin mRNA is increased, thus leading to stabilization and translation of globin mRNA in the cytoplasm.

4416 LEUKEMIA VIRUS-INDUCED ALTERATION OF LYMPHOCYTE Ig SURFACE RECEPTORS AND THE "CAPPING" RESPONSE OF MOUSE SPLEEN AND LYMPH NODE CELLS. *(E.)* Kateley, J. (Albert Einstein Med. Cent., Philadelphia, Pa.), J. Holderbach and H. Friedman. *J Natl Cancer Inst* 53(4):1135-1140, 1974.

The presence of immunoglobulin (Ig)-positive lymphocytes, presumably B cells, in spleens and lymph nodes d their ability to "cap" were studied after i.v. fection of BALB/c mice with Friend leukemia virus LV). As FLV infection proceeded, the number of -positive cells decreased in the spleen and increas- l in the lymph nodes. However, the ability of these ells in either lymphoid tissue to cap was severely nhibited. Both the dose of FLV and the virus pre- aration used for infection influenced the number of g-positive cells and their capping response. Mice nfected with the highest (10^{-1}) virus dose showed he greatest reduction in Ig-positive spleen cells, he greatest increase in Ig-positive lymph node cells, nd the lowest percentage of cells with capping. Com- ared with mice given intact FLV preparations [spleen ocus-forming virus + lymphatic leukemia virus (LLV)], ice infected with LLV preparations had more B cells n spleens and fewer in lymph nodes. The capping re- ponse of these cells decreased more in mice infected ith intact preparations. Mice infected with the ighest virus dose and immunized with sheep RBC howed the greatest reduction (> 50%) in the percen- age of Ig-positive spleen cells which could cap. The reduced ability of cells in lymphoid tissue of FLV-infected mice to cap supports the view that the virus infected a B-cell precursor and so altered the number of Ig-bearing cells.

4417 STUDIES ON A GROSS-VIRUS-INDUCED LYMPHOMA IN THE RAT. I. THE CELL-MEDIATED IMMUNE RESPONSE. *(E.)* Shellam, G. R. (Dep. Zool., Univ. Coll., London, England). *Int. J Cancer* 14(1):65-82, 1974.

In vivo and *in vitro* studies on the Gross virus-induced lymphoma (C58NT)D, originally induced in the thymus of W/Fu rats, showed that it is a virus-releasing tumor with no detectable θ antigen or surface immunoglobulin. It was rapidly malignant in immunosuppressed rats with an LD_{50} of approximately 100 cells, but strongly immunogenic in intact adult rats, inducing both long-lasting immunity *in vivo* and a vigorous cell-mediated immune response *in vitro*. A tumor challenge was rejected in an immune fashion within a maximum of 142 days after primary innoculation, with the most rapid rejection at 9 and 62 days postimmunization. Cell-mediated immunity (CMI), measured in an *in vitro* ^{51}Cr release assay, showed a sequential appearance in draining lymph nodes, thoracic duct lymph, and the spleen with peak activity in days 6, 7, and 10 after immunization, followed by a rapid decline in activity. Spleen cells taken on the day of peak CMI adoptively conferred protection against tumor growth *in vivo*. The CMI response *in vitro* was specific for murine leukemia virus-induced tumors, as shown by study of ^{51}Cr release from a variety of tumor cells in the presence of immune spleen cells, and by a comparison of the ability of various unlabeled tumor cells to inhibit the lysis of Gross-virus induced lymphoma cells. Purified Gross virus, but not the antigenically unrelated NDV, inhibited CMI *in vitro*. The effector cell in CMI *in vitro* was not removed by procedures which selectively depleted immune cells of adherent and phagocytic cells and B lymphocytes. However, the removal of T lymphocytes either prior to immunization by thymectomy, irradiation and marrow reconstitution, or from immune spleen cells by the use of a specific antiserum, abrogated the CMI response. These results indicate that the effector cell in the *in vitro* assay was a T lymphocyte.

4418 COMPARATIVE PATHOLOGY OF CELLS TRANSFORMED BY HERPES SIMPLEX VIRUS TYPE 1 OR TYPE 2. *(E.)* Duff, R. (Milton S. Hershey Med. Cent., Pennsylvania State Univ., Hershey), J. W. Kreider, B. M. Levy, M. Katz and F. Rapp. *J Natl Cancer Inst* 53(4):1159-1164, 1974.

The transformation of normal hamster embryo cells by UV-irradiated herpes simplex virus type 1 (HSV-1) and type 2 (HSV-2) resulted in two basic cell morphologies. Cells transformed by HSV-1 developed a primarily epithelioid morphology while cells transformed by HSV-2 were predominantly fibroblastoid. On s.c. injection of 2×10^5 cells, epithelioid cells induced fibrosarcomas in newborn hamsters. Cells isolated from these tumors and grown in culture retained a morphology similar to that of the original cells before animal passage. Less than 10 viable tumor cells induced lesions in weanling hamsters. The pathology of the neoplasms in weanling hamsters again corresponded to the morphology of the cells injected.

4419 EFFECT OF DEXAMETHASONE ON HERPES SIMPLEX VIRUS TYPE 2 INFECTION *IN VITRO*. *(E.)* Costa, J. (Natl. Cancer Inst., Bethesda, Md.), C. Yee, T. Troost and A. S. Rabson. *Nature* 252(5485): 745-746, 1974.

In mouse 3T3 cells infected *in vitro* with the syncytial strain of herpes simplex virus type 2 (10^6 plaque-forming U), dexamethasone (10^{-5} to 10^{-7}) and cortisol (10^{-6} M) produced a 10-fold or greater increase in 24-hr virus yield and 2- to 5-fold increases in plaquing efficiency. In Swiss mouse fibroblasts, the two glucocorticoids produced no increase in virus yield or plaquing efficiency; they did cause a reduction in plaque diameter that correlated with a decrease in the ratio of released virus to cell-associated virus 24 hr after infection.

4420 ENCHANCED REPLICATION OF TEMPERATURE-SENSITIVE MUTANTS OF HERPES SIMPLEX VIRUS TYPE 2 (HSV-2) AT THE NONPERMISSIVE TEMPERATURE IN CELLS TRANSFORMED BY HSV-2. *(E.)* Kimura, S. (Baylor Coll. Med., Houston, Tex.), J. Esparza, M. Benyesh-Melnick and P. A. Schaffer. *Intervirology* 3(3): 162-169, 1974.

To determine whether the herpes simplex virus type 2 (HSV-2) genetic information present within HSV-2-transformed cells could assist in the replication of temperature-sensitive (ts) mutants of HSV-2 at the nonpermissive temperature (38 C), the replication of eight ts mutants of HSV-2 was examined in normal, simian virus 40 (SV40)-transformed, and HSV-2-transformed hamster embryo fibroblasts (HEF). The wild-type (WT) virus replicated well in normal and HSV-2-transformed HEF; the mutant tsF3 did not replicate well in either cell type, but the growth of two other mutants (tsG4 and tsD6) was enhanced 10-fold and 6-fold, resp., in HSV-2-transformed as compared with normal HEF. Yields of tsG4 and tsD6 were maximal at 24 hr postinfection. Antiserum treatment of the infected cells immediately after adsorption had no effect on the yields of infectious virus or on the degree of enhancement of any of the mutants. The replication of two DNA+ and four DNA- ts mutants was not markedly enhanced in HSV-2-transformed cells compared with normal HEF; the replication of the two DNA+ mutants, tsD6 and tsG4, was, however, significantly enhanced in the HSV-2-transformed cells. No enhancement of yield was observed with any of the ts mutants in the SV40-transformed cells. The results suggest that resident, functional HSV genetic information in HSV-2-transformed cells assisted the replication of the ts mutants by complementation mechanisms.

4421 *IN VITRO* TRANSFORMATION OF LEUKOCYTES WITH A GUINEA PIG HERPES-LIKE VIRUS. *(E.)* Hsiung, G. D. (VA Hosp., West Haven, Conn.), C. K. Y. Fong, and K. M. Lam. *Bibl Haematol* (39):401-409, 1973.

The oncogenic potential of guinea pig herpes-like virus and its possible relationship to other herpesviruses was investigated. Although the virus is not demonstrable in leukocytes taken from infected animals, these cells were found to contain intranuclear inclusions after *in vitro* cultivation in a CO_2-air mixture incubator, as well as viral particles revealed by electron microscopy. Leukocytes from healthy Hartley guinea pigs were infected with the virus and incubated at 35 C in a CO_2-air mixture. While noninfected controls disintegrated by 14 days, transformed cells survived for at least 28 days before disintegration. These transformed cells caused no disease when inoculated into guinea pigs. Antigenic properties of the virus were studied by means of the indirect hemagglutination test, using virus-coated RBCs as the antigen. Sera from man infected with Epstein-Barr (EB) virus, and from chickens infected with Marek's disease virus showed low and distinct indirect hemagglutination titers. Of 12 human sera from people with and without EB infection, 10 showed similar antigenicity to guinea pig herpes-like virus. It is concluded that there is antigenic similarity between the three viruses. This, plus the *in vitro* activation of the virus, which resembles the behavior of EB virus, supports the hypothesis that guinea pig herpes-like virus may be an oncogenic herpesvirus.

4422 DISTINCTIVE PROPERTIES OF THYMIDINE KINASE ISOZYMES INDUCED BY HUMAN AND AVIAN HERPESVIRUSES. *(E.)* Kit, S. (Baylor Coll. Med., Houston, Tex.), W. C. Leung, G. N. Jorgensen and D. R. Dubbs. *Int J Cancer* 14(5):598-610, 1974.

The thymidine (dT) kinases induced by human herpes simplex virus types 1 and 2 (HSV-1 and HSV-2) and by avian infectious laryngotracheitis virus (ILTV) and herpesvirus of turkeys (HVT) were compared with respect to sensitivity to inhibition by deoxyuridine triphosphate and deoxycytidine triphosphate (dCTP), rate of heat inactivation, and antigenic determinants. The human and avian herpesvirus-induced dT kinases differed from the cytosol dT kinases of infected cells with respect to electrophoretic mobility, isoelectric point, and phosphate donor specificity. The human and avian herpesvirus-induced dT kinases differed from the mitochondrial dT kinases of infected cells with respect to sedimentation coefficients and sensitivity to dCTP inhibition. The HSV-1 and HSV-2-induced dT kinases differed from the human cytosol and mitochondrial dT kinases in thermal lability and antigenic determinants. The cellular and viral-induced dT kinase isozymes were all inhibited by the end-product inhibitor, dTTP. Immunoglobulin (Ig) from the sera of rabbits immunized with the HSV-1-induced dT kinase inhibited the homologous enzyme, and some anti-type 1 Ig preparations partially inhibited the HSV-2 dT kinase, but the anti-type 1 Ig inhibited neither cytosol and mitochondrial dT kinases from human, mouse, or monkey cells, nor the dT kinases induced by ILTV, HVT, or vaccinia virus. Anti-type 2 Ig inhibited the homologous HSV-2 dT kinase, but not HSV-1 or human mitochondiral dT kinase.

4423 A NONHUMAN PRIMATE MODEL FOR THE STUDY OF THE CERVICAL ONCOGENIC POTENTIAL OF HERPES SIMPLEX VIRUS TYPE 2. *(E.)* London, W. T. (Natl. Inst. Neurol. Dis. Stroke, Bethesda, Md.), A. J. Nahmias, Z. M. Naib, D. A. Fuccillo, J. H. Ellenberg and J. L. Sever. *Cancer Res* 34(5):1118-1121, 1974.

A primary genital infection with herpes simplex virus type 2 can be established in Cebus monkeys with the development of genital lesions in approximately one-half of the infected animals. The lesions occur on the vulva and on the cervix and occasionally are observed at other sites. The animals recover from the infection with no neurological or visceral complications, so that follow-up studies of cancer development are possible. As in humans, spontaneous genital recurrences can occur in infected monkeys. Venereal transmission from genitally infected female monkeys to males has occurred. The presence of herpes simplex virus antibodies prior to herpes simplex virus type 2 genital inoculation does not appear to influence the rate of genital infection as compared to animals with no herpes simplex virus antibodies in their serum.

4424 TRANSFORMATION OF HAMSTER EMBRYO AND HUMAN EMBRYO CELLS BY TEMPERATURE SENSITIVE MUTANTS OF HERPES SIMPLEX VIRUS TYPE 2. *(E.)* Takahashi, M. (Res. Inst. Microb. Dis., Osaka Univ., Japan) and K. Yamanishi. *Virology* 61(1):306-311, 1974.

The ability of 12 temperature-sensitive (ts) mutants of Herpes simplex virus type 2 (HSV-2) to transform hamster embryo (HaE) cells and human embryo (HuE) cells *in vitro* at the nonpermissive temperature (38.5 C) was studied. Three mutants (ts 4, 9, 35) gave rise to transformed HaE cells and one mutant

; 9) induced transformation in HuE cells. All ansformed cell lines have been passaged more than times. The injection of transformed HaE cells to hamster resulted in the formation of tumors ich were hard compared with those induced by simian rus 40 (SV 40) for adenovirus and developed more owly. Unlike SV 40 tumor-bearing animals or adeno-mor-bearing animals, metastases of the tumor cells re frequently found in the lungs of the HSV-tumor-aring hamsters. Cultured cells derived from these mors were morphologically similar to the original ansformed cells. No infectious HSV-2 has been covered from the original HaE or HuE cells or the ltured tumor cells. Fluorescent antibody staing revealed distinct flourescence in the cytoplasm 5-10% of the transformed HaE and HuE cells; no uorescence was seen in normal HaE or HuE cells or simian adeno-SA$_7$ transformed cells. Nor was any uorescence detected when the cells were treated th preimmune, as opposed to postimmune, rabbit erum.

25 DEOXYCYTIDYLATE DEAMINASE. EVIDENCE FOR A NEW ENZYME IN CELLS INFECTED BY THE VIRUS HERPES SIMPLEX. *(E.)* Rolton, H. A. (Dep. Biochem., iv. Aberdeen, Scotland) and H. M. Keir. *Biochem* 143(2):403-409, 1974.

ne properties of the deaminase purified from herpes implex virus-infected baby hamster kidney cells ere investigated. The deaminase was purified by entrifugation, precipitation by ammonium sulfate, el filtration and column chromatography. No significant differences were observed in the behavior f the enzymes from infected and mock-infected cells uring purification. The activities of dCMP deaminse and DNA polymerase I increased two-fold and ive-fold, resp., in the hamster kidney cells after nfection by the virus. The increases were greatly iminished, and under certain conditions prevented, y inclusion of actinomycin D or cycloheximide in he cell-virus system during the infective cycle. he dCMP deaminase purified from infected cells harested eight hr after infection differed from the eaminase purified from non-infected cells inasmuch s (1) it was more resistant to heating at 37, C (2) he substrate (dCMP) concentration at half-maximum elocity was lower, (3) maximum activation was achiev-d by a lower concentration of dCTP, (4) it was more esistant to inhibition by dTTp, and (5) it behaved ifferently when assayed in the presence of a herpes irus-specific antiserum. The DNA polymerase acivity in the infected cells was markedly decreased n the presence of the herpes virus-specific antierum, but was stimulated in the host cell DNA. It s concluded that one result of infection of baby hamter kidney cells by herpes simplex virus is the synhesis of a new dCMP deaminase whose properties differ n several respects from those of the host-cell enzyme.

426 ONCOGENIC CONVERSION OF NORMAL CELLS BY INACTIVATED HERPES SIMPLEX VIRUS. *(E.)* Rapp, F. (Coll. Med., Pennsylvania State U., Hershey) and R. Duff. *Cancer* 34(4):1353-1362, 1974.

There are two genetically distinct subtypes of herpes simplex virus (HSV) endemic in human populations. Both Type 1 and Type 2 viruses induce several pathologic conditions and have now been associated with a variety of human neoplasms by serologic techniques. Support for the oncogenic potential of these viruses derives from several observations including data from seroepidemiologic studies, which have consistently linked an increased incidence of neutralizing antibodies to HSV-2 with the presence of cervical carcinoma. In addition, the presence of antibody to early (nonvirion) herpesvirus antigens has been reported in patients with invasive cervical carcinoma and eight other neoplasms of the oral and genital area, but not in normal cases. Finally, in the presence of HSV-2 antigens in exfoliating cervical carcinoma cells, recovery of a virus identified immunologically as HSV-2 from virus-free tumor cells maintained in culture, and the detection of a fragment of the HSV-2 genome in cells from one cervical tumor associates the virus with chromosomes of neoplastic cells. Equally significant are the multiple demonstrations that HSV-1 and HSV-2 can transform hamster, mouse, and human cells in culture to cells that can then establish permanent lines, contain virus nucleic acids and express virus markers. These cells may be malignant when transplanted into histocompatible hosts. Taken together, these observations strongly associate herpes simplex viruses with a variety of human cancers and urge further study to resolve their role in etiology.

4427 MAREK'S DISEASE HERPESVIRUS-INDUCED DNA POLYMERASE. *(E.)* Boezi, J. A. (Dep. Biochem., Michigan State Univ., East Lansing), L. F. Lee, R. W. Blakesley, M. Koenig, and H. C. Towle. *J Virol* 14(5):1209-1219, 1974.

Infection of duck embryo fibroblasts by Marek's disease herpesvirus (MDHV), strain GA, led to the induction of a novel DNA polymerase. This polymerase, designated MDHV-induced DNA polymerase, could be distinguished from the DNA polymerase activities of uninfected duck embryo fibroblasts by its chromatographic behavior on phosphocellulose, by its sedimentation coefficient, and by its catalytic properties. The characteristics of MDHV-induced polymerase which had been purified by phosphocellulose chromatography were investigated. The sedimentation coefficient, as determined by sucrose density gradient centrifugation in the presence of 0.25 M KCl, was 5.9S. From this sedimentation coefficient, the molecular wt of the purified DNA polymerase was estimated to be 100,000. MDHV-induced DNA polymerase could not effectively use either poly(dA)·oligo(dT)$_{12-18}$ or poly (dC)·oligo(dG)$_{12-18}$ as a template primer. The DNA polymerases from uninfected duck embryo fibroblasts could use these synthetic template primers. MDHV-induced DNA polymerase also could not use poly(rA)·oligo(dT)$_{12-18}$ or poly(rC)·oligo(dG)$_{12-18}$ as template primers or oligo(dT)$_{12-18}$ as a primer, indicating that it is not a type R-DNA polymerase, reverse transcriptase, or a terminal nucleotidyl transferase. *In vitro* synthesis of DNA by MDHV-induced DNA polymerase was markedly inhibited by the addition of (NH$_4$)$_2$SO$_4$ to the reaction mixture.

4428 BURKITT'S LYMPHOMA, MALIGNANT LYMPHOMA AND LYMPHOCYTIC LEUKEMIA. *(E.)* Hunt, R. D. (Harvard Med. Sch., Southborough, Mass.) and L. V. Melendez. *Am J Pathol* 76(2):415-418, 1974.

The biologic features, natural host range, and malignant effects when inoculated into animals outside this host range are discussed for *Herpesvirus saimiri* and *Herpesvirus ateles*. These characteristics are compared to the analogous situation of Epstein Barr virus (EBV) in humans. *H. saimiri* and *H. ateles* cause lymphoma in species of monkeys other than their natural host. EBV genome appears to exist in Burkitt's lymphoma cells and nasopharyngeal carcinoma cells in a manner analogous to *H. saimiri* and *H. ateles* in neoplastic cells of monkeys. The pathologic features of Burkitt's lymphoma and *H. saimiri* and *H. ateles* lymphoma are comparable in that all are neoplastic diseases of lymphocytes. It is concluded that the animal model systems with *H saimiri* and *H. ateles* provide excellent laboratory systems to study the mechanisms of herpesvirus oncogenicity.

4429 *IN VITRO* IMMUNOLOGICAL CHARACTERISTICS OF LYMPHOID CELLS DERIVED FROM OWL MONKEYS INFECTED WITH *HERPESVIRUS SAIMIRI*. *(E.)* Wallen, W. C. (Litton Bionetics, Inc., Kensington, Md.), R. H. Neubauer and H. Rabin. *J Med Prim* 3(1):41-53, 1974.

Herpesvirus saimiri (HSV)-infected lymphoid cell lines of owl monkey origin were examined for several immune properties, including blastogenic response to general mitogens, interferon production, lymphotoxin and immunoglobulins, and direct cytotoxocity on established cell lines. The lymphoid cells from the HSV-infected monkeys reacted mitogenically to large doses of phytohemagglutinin, were highly cytotoxic for certain fibroblastic cell lines (rhesus foreskin fibroblasts, human foreskin fibroblasts, and rhesus monkey tooth bud fibroblasts), in a nonspecific manner, and produced interferon. The cells were not cytotoxic for vero, HeLa, rhesus monkey kidney or owl monkey cells. No released immunoglobulin or lymphotoxin was detected in the culture fluids from these cells. The cells did not respond to general mitogens at normal blastogenic doses. Nonspecific receptors for sheep RBC were detected on about 90% of cultured HVS cells from owl monkeys and from one line of marmoset monkey origin. These cells lacked receptor for modified complement as well as readily detectable immunoglobulin. The results support the view that, *in vivo*, the target cells for HVS in both owl and marmoset monkeys belong to the T-cell subpopulation of lymphocytes.

4430 INFLUENCE OF INTERFERON ON THE REPLICATION OF ONCOGENIC HERPESVIRUSES IN TISSUE CULTURES AND IN NONHUMAN PRIMATES. *(E.)* Laufs, R. (Hyg. Inst., U. Gottingen, W. Germany), H. Stienke, C. Jacobs, J. Hilfenhous and H. Karges. *Med Microbiol Immunol* 160(4):285-294, 1974.

The sensitivity of *H. saimiri* (HVS) and *H. ateles* (HVA) to human interferon (HIF) was determined using owl monkey kidney (OMK) cell cultures. Both of these oncogenic herpesviruses were relatively insensitive to the action of interferon. The virus multiplication could be inhibited when the cells were pretreated with high concentrations of interferon (4000 British Standard U/ml). The degree of protection against HVS was improved when the cells were kept in interferon medium after challenge with the virus. The replication of HVS during cocultivation of lymphoid carrier cells with permissive indicator cells was inhibited with HIF, which acted only on the indicator cells. The transition of the HVS genome in the lymphoid cells from the latent to the productive stage could not be inhibited by interferon. High doses of HIF did not prevent the development of malignant lymphoma induced by HVS or HVA in CT marmoset monkeys. The survival time after infection with HVS was prolonged in one of the HIF-treated monkeys (334 BRJ U/g followed by 66 U/g every 2nd day postinfection), while tumor development induced by HVA was not influenced by HIF (400 BRS U/g followed by 80 U/g every 2nd day postinfection).

4431 EFFECT OF TRANSFORMATION BY HAMSTER SARCOMA VIRUS ON THE GLYCOLIPID COMPOSITION OF SECONDARY HAMSTER EMBRYO CELLS AND THE Nil CELL LINE. *(E.)* Sakiyama, H. (Dep. Biol., Massachusetts Inst. Technol., Cambridge) and P. W. Robbins. *In Vitro* 9(5):331-338, 1974.

Glycolipid synthesis was investigated in secondary hamster embryo cells and two Nil (hamster) clones at 24-hr intervals following infection with hamster sarcoma virus (4 focus-forming U in secondary cells and 0.5 focus-forming U in Nil cells). In secondary cells, a decrease in the synthesis of the sialoglycolipid G_{M3} on the fifth day postinfection coincided with the stimulation of glucose transport. The synthesis of GL-5 and GL-4 was also reduced but this change became evident only 14 days after infection. At one point during the transition to transformation, GL-5 (Forstmann antigen) levels were higher in infected cells than in uninfected. In cells of one of the two Nil clones, synthesis of G_{M3}, GL-5, GL-4, and GL-3 began to decrease on the third day postinfection, whereas an increased level of glucose transport was seen only five days after infection. GL-3 was no longer detectable six days after infection and GL-4 was not detectable at 14 days. Decreases in GL-5 and G_{M3} were less dramatic. Cells of the second infected clone showed increased glucose uptake and decreased G_{M3} synthesis on the third day after infection. These results demonstrate the complexity of the pathways of glycolipid synthesis in hamster sarcoma virus-transformed cells. There is no obvious relation between any particular glycolipid change and other manifestations of transformation.

4432 SURFACE ANTIGENS OF MAMMALIAN SARCOMA VIRUS-TRANSFORMED NONPRODUCER CELLS. *(E.)* Aoki, T. (Natl. Cancer Inst., Bethesda, Md.), J. R. Stephenson, S. A. Aaronson, and K. C. Hsu. *Proc Natl Acad Sci USA* 71(9):3445-3449, 1974.

onal BALB/3T3 mouse cells were transformed *in vi-*
o into nonproductive sarcoma cells (K-BALB cells)
Kirsten murine sarcoma virus. Similarly, the
rsten sarcoma virus and wooly monkey sarcoma virus
ansformed normal rat embryonic kidney (NRK) cells
nonproductive sarcoma K-NRK and W-NRK cells,
sp. The presence of sarcoma cell surface antigen
CSA) on these three different cell lines was exam-
ed by immunoelectron microscopy using rabbit anti-
BALB, anti-K-NRK, and anti-W-NRK sera preabsorbed
th normal embryonic rat cells, NKR cells, and
LB/3T3 cells. Four different specific SCSAs were
monstrated: SCSAa, an antigen specific to the
rface of W-NRK cells; SCSAb, a surface antigen
mmon to K-NRK and W-NRK cells; SCSAc, a surface
tigen common to K-BALB and W-NRK cells; and SCSAd,
surface antigen broadly reactive with the rabbit
tisera to W-NRK, K-NRK, and K-BALB.

433 SEQUENCE HOMOLOGY BETWEEN THE RNA OF MASON-PFIZER MONKEY VIRUS AND THE RNA OF HUMAN
ALIGNANT BREAST TUMORS. *(E.)* Colcher, D. (Meloy
ab., Springfield, Va.), S. Spiegelman and J. Schlom.
roc Natl Acad Sci USA 71(12):4975-4979, 1974.

adioactive DNA (^{3}H-cDNA) complementary to the RNA
f Mason-Pfizer monkey virus was used in molecular
ybridization experiments to demonstrate sequence
omology between its viral RNA and RNA of human mam-
ary adenocarcinomas. Hybridization products were
nalyzed by cesium sulfate equilibrium density cen-
rifugation and hydroxylapatite chromatography.
even of ten human malignant breast tumors tested
ontained virus-related RNA when assayed by hydroxyl-
patite chromatography, whereas no sequence homology
as found in RNA from 11 human benign breast tumors
r from RNA of normal human spleen, liver, or kidney.
ybridizations between ^{3}H-cDNA of the monkey virus
nd human breast adenocarcinoma RNA showed a $C_rt_{1/2}$
product of RNA concentration in moles of nucleotide
nd time (sec) of incubation] of about 2 x 10^4. The
idelity of the hybrids formed was indicated by a T_m
of 80.5 C.

434 OCCURRENCE OF MASON-PFIZER MONKEY VIRUS IN HEALTHY RHESUS MONKEYS. *(E.)* Ahmed, M.
John L. Smith Mem. Cancer Res., Pfizer, Inc., May-
vood, N. J.), G. Schidlovsky, W. Korol, G. Vidrine
and J. L. Cicmanec. *Cancer Res* 34(12):3504-3508,
1974.

The Mason-Pfizer monkey virus (M-PMV) was originally isolated from the breast tumor cells of a female rhesus monkey. The incidence of M-PMV in normal rhesus monkey populations was examined by testing sera for specific viral antibody and by analyzing monkey breast tissues, placentas, fetuses, and milk samples for the presence of M-PMV and/or its antigens. Micro-immunodiffusion and immunofluorescence tests revealed no specific reactivity against M-PMV antigens in any of over 200 serum samples tested. Adult monkeys immunized with repeated doses of sucrose density gradient-purified M-PMV produced only very weak antibody against M-PMV. Intracytoplasmic M-PMV antigens and budding M-PMV-like particles were found in all of three normal mammary biopsies which grew successfully in explant cultures; M-PMV-like virus was also seen in mammary biopsies taken from the same three monkeys 8-10 wk later. Of 22 fetuses screened after culture for M-PMV particles, one showed M-PMV-like particles, and eight have demonstrated M-PMV antigens. Treatment of the antigen-positive cultures with 5-iododeoxyuridine or cocultivation with human lymphoblastoid suspension cells failed to produce complete virus particles. M-PMV was also isolated from a rhesus placenta which had previously yielded typical type-C particles and three placentas which were cocultivated with NC-37 cells. When tested against M-PMV antiserum, the isolated virus showed a line of identity with the precipitin line produced by the major internal M-PMV protein, 27,000 daltons, in the microimmunodiffusion test. None of the eight milk samples reacted in the microimmunodiffusion test against specific M-PMV antiserum.

4435 TEMPERATURE-SENSITIVE MUTANTS OF MURINE LEUKEMIA VIRUS. IV. FURTHER PHYSIOLOGICAL CHARACTERIZATION AND EVIDENCE FOR GENETIC RECOMBINATION. *(E.)* Stephenson, J. R. (Natl. Cancer Inst., Bethesda, Md.). S. R. Tronick and S. A. Aaronson. *J Virol* 14(4):918-923, 1974.

Six temperature-sensitive (ts) mutants of the Rauscher strain of murine leukemia virus representing three distinct physiological groups have been further characterized. Genetic recombination between different pairs of these mutants was demonstrated by assay of XC plaque-forming activity in infected NIH3T3 cultures. Several representative genetic recombinants were isolated and shown to replicate equally well at the permissive (31 C) and nonpermissive (38 C) temperatures. The host range and serological properties of the recombinant viruses were indistinguishable from those of the parental wild-type virus. Although these results do not discriminate between the alternative possibilities of subunit reassortment and classic genetic recombination, the fact that several ts mutant pairs recombined favors the latter mechanism.

4436 METABOLIC INHIBITORS AND VIRAL LYMPHOMAGENESIS IN THYMIC GRAFTS. *(E.)* Hays, E. F. (U. California, Ctr. Hlth. Sci., Los Angeles). *J Natl Cancer Inst* 53(2):561-566, 1974.

The effect of actinomycin D, puromycin, cytarabine, 3-(4-benzylpiperazineiminomethyl)rifampicin SV (AF/ABP), streptovaricin complex, and streptonigrin on lymphomagenesis in murine leukemia virus-infected AK mouse thymuses grafted into syngeneic hosts was studied. Grafts with viral infection induced at the time of grafting, with 24-hr established infection, and with 3-wk established infection were tested. Thymic lymphomagenesis was inhibited by actinomycin D, AF/ABP, streptovaricin, and streptonigrin if present at the time of initial viral infection. Only actinomycin D inhibited lymphoma development after 24 hr of virus infection, and no inhibition with three-wk established infection was demonstrated. These inhibitors did not impair thymic graft functions as measured by ability to develop lymphoma in virus-infected hosts, ability to restore immune responsiveness in thymectomized irradiated mice, and regenerative capacity.

4437 EXPRESSION OF THE MAJOR INTERNAL VIRAL POLYPEPTIDE IN CELLS TRANSFORMED BY WILD-TYPE AND TEMPERATURE-SENSITIVE MURINE SARCOMA VIRUS. *(E.)* Spira, G. (Baylor Coll. Med., Houston, Tex.), G. R. Dreesman, M. Benyesh-Melnick, S. Kit, and K. D. Somers. *J Virol* 14(5):1245-1252, 1974.

Phenotypic expression of the murine intraspecies and interspecies antigenic determinants of the major type C viral structural 30,000-dalton polypeptide, p30, was measured by radioimmunoassay inhibition in cell lines from different species. Uninfected normal rat kidney (NRK) cells did not contain detectable levels of murine intraspecies and interspecies p30 antigen, whereas rat cells transformed by and producing murine sarcoma virus (MSV)-Moloney leukemia virus (M-MSV-MuLV) contained high levels of both murine intraspecies and interspecies p30 antigen. Significant amounts of murine intraspecies and interspecies p30 antigen were detected in wild-type MSV-transformed nonproducer NRK cells. The control of p30 antigen expression was examined in temperature-sensitive MSV-transformed nonproducer cells [NRK(MSV-1b)] which are cold sensitive for maintenance of the transformed phenotype. Both murine intraspecies and interspecies p30 antigens were detected in NRK(MSV-1b) cells when grown at the permissive (39 C) or nonpermissive (33 C) temperature, suggesting that p30 antigen expression is not correlated with maintenance of the transformed phenotype. The results demonstrate that previously undetectable p30 antigens are expressed in MSV-transformed nonproducer NRK cells, and suggest that the expression of p30 antigen may be a useful marker for viral gene expression in mammalian cells.

4438 REVERTANTS OF MOUSE CELLS TRANSFORMED BY MURINE SARCOMA VIRUS: FLAT VARIANTS WITHOUT A RESCUABLE SARCOMA VIRUS FROM A CLONE OF BALB/3T3 TRANSFORMED BY KIRSTEN MSV. *(E.)* Nomura, S. (Natl. Cancer Inst., Bethesda, Md.), K. J. Dunn, C. F. T. Mattern, J. W. Hartley and P. J. Fischinger. *J Gen Virol* 25(2):207-218, 1974.

A clonal subline of Kirsten murine sarcoma virus (Ki-MSV)-transformed nonproducer BALB/3T3 (Ki-BALB) cells spontaneously produced flat variants with some properties of nontransformed cells at frequencies of 0.01-0.001. The variants were epithelioid, contact-inhibited, grew to low saturation density, and exhibited variable cloning efficiencies in soft agar. They demonstrated no murine leukemia group-specific antigen(s), no reverse transcriptase activity, and no infectious virus but were agglutinable by concanavallin A. Murine leukemia virus (MuLV) was induced after 5-iododeoxyuridine (IUDR, 20 μg/ml) treatment from both the flat variants and from the parental Ki-BALB cells. However, Ki-MSV could not be rescued from these flat variants by superinfection with MuLV nor induced by IUDR treatment. The state of reversion was stable, revealing no back-transformation during 30-40 subcultures. The flat variants produced no tumors in syngeneic mice inoculated s.c. with 10^4, 10^5, or 10^6 cells, whereas the same numbers of Ki-BALB cells produced tumors in 8 of 10, 5 of 5, and 6 of 6 animals, resp. All flat variants were susceptible to MSV and MuLV infection. The loss of the transformed phenotype in spontaneous flat variants was associated with a decrease in chromosome number to a level similar to BALB/3T3 cells. These observations suggest that these revertants may have lost some or all of the Ki-MSV genome.

4439 PHOSPHORYLATION BUT NOT TRANSPORT OF SUGARS IS ENHANCED IN VIRUS-TRANSFORMED 3T3 CELLS. *(E.)* Colby, C. (Dep. Genet., Univ. California, Davis) and A. H. Romano. *J Cell Physiol* 85(1): 15-23, 1974.

Transformation of mouse 3T3 cells by sarcoma virus was accompanied by increases in both the rate and extent of total uptake of 2-deoxy-D-glucose (2-dOG). The apparent enhancement of 2-dOG uptake was not due to an effect on the transport process but to enhanced phosphorylation by intracellular kinases. Double labeling experiments showed that in both normal and transformed cells, 2-dOG enters the cell in free form and is secondarily converted to 2-dOG-P by intracellular hexokinase. Thus, the primary changes in glucose metabolism associated with malignant transformation of cells appear not to be at the level of membrane-associated transport; instead the mechanism of these primary changes may be connected with the complexities of the intracellular regulation of glycolysis. Phosphorylation of 3-O-methyl-D-glucose (3-O-MeG) does not occur in 3T3 cells. Both the rate and extent of transport of this glucose analog are the same in normal cells, Simian virus 40-transformed cells, and sarcoma virus-transformed cells. The mutual competition between 2-dOG and 3-O-MeG and differences in the kinetic constants of their uptake suggest that 3-O-MeG may be inappropriate for study of the glucose transport system of animal cells.

4440 CELL CULTURE FROM A RAT BRAIN TUMOR INDUCED BY INTRACEREBRAL INOCULATION WITH MURINE SARCOMA VIRUS. *(E.)* Ida, N. (Toyo Kogyo Hosp., Hiroshima, Japan), Y. Ikawa, K. Ogawa, M. Takada and H. Sugano. *J Natl Cancer Inst* 53(2): 431-447, 1974.

A cell culture line of possible glial cell origin was established from a brain tumor induced in a 3-month-old Sprague-Dawley rat by the Moloney strain of murine sarcoma virus (MSV) (congenitally or vertically transmitted). The cultured cells, which were globular or pear-shaped with protoplasmic processes and highly refractile membranes, were successively transplanted in suckling Sprague-Dawley rats by intracerebral, s.c., or i.m. injection. Young rats bearing the transplanted s.c. tumor showed metastases to the lungs, liver, spleen, kidneys, regional lymph nodes, and thymus. Cell-free extracts of cultured cells induced brain tumors in newborn rats and Swiss/Icr mice inoculated intracerebrally and sarcomas in mice inoculated i.m. The results of focus formation by cell culture supernatants and electron microscopic studies of viral particles in the extracellular spaces and cytoplasmic cisternae indicated that the cultured glial cells produced infectious MSV.

4441 IMMUNITY TO MURINE SARCOMA VIRUS INDUCED TUMOURS. III. ANALYSIS OF THE CELL POPULATIONS INVOLVED IN PROTECTION FROM LETHAL TUMOUR PROGRESSION OF SUBLETHALLY IRRADIATED, MSV INOCULATED, MICE.

(E.) Gorczynski, R. M. (Imperial Cancer Res. Fund, U. Coll., London, England) and C. Norbury. *Br J Cancer* 30(2):118-128, 1974.

A comparison was made between BALB/c mice cells responsible for demonstrable activity against murine sarcoma virus (MSV) antigens, using both *in vivo* and *in vitro* assays. Similar cells (in terms of size and sensitivity to anti-theta serum) were detected in both assays. However, while lymphoid cells from animals at all stages post-MSV infection were active in protecting irradiated mice from the lethal effect of induction of MSV sarcomas, cells from animals at early stages post-MSV infection (when the tumor was in a progressive phase of growth) were not active in the *in vitro* assay. By manipulation of the *in vivo* assay conditions a situation was observed in which cells from "progressor animals" were able to suppress both the *in vitro* and *in vivo* activity of regressor lymphoid cells. It is suggested that sensitized antigen-specific T lymphocytes may activate non-T cells (macrophages) to kill tumor cells. It is also suggested that non-antigen specific blocking of T-cell-mediated immunity and blocking by serum factors may be encompassed within the same model, the difference between the 2 types of suppression being perhaps only the concentration of blocking factors present.

4442 PROPERTIES OF 3T3 CELLS TRANSFORMED BY MURINE SARCOMA VIRUS IN THE ABSENCE OF REPLICATING MURINE LEUKEMIA HELPER VIRUS.

(E.) Bassin, R. H. (Natl. Cancer Inst., Bethesda, Md.), L. A. Phillips, M. J. Kramer, D. K. Haapala, P. T. Peebles, S. Nomura and P. J. Fischinger. *Bibl Haematol* (39): 272-280, 1973.

Murine sarcoma virus (MSV)-transformed Swiss 3T3 cells which do not release infectious leukemia or sarcoma virus (S+L- cells) were investigated with respect to the nature of MSV defectiveness and the role of murine leukemia helper virus (MuLV). Examination of ^{3}H-uridine-labeled particles recovered from S+L- culture fluids revealed lack of RNA larger than 60S. These particles are incapable of transforming cells, unlike the MSV rescued from these cells, indicating the particles are defective parts of the MSV genome and not leukemia virus. Quantitative studies of MSV rescue from cells infected with Moloney leukemia virus showed that both replication of MuLV and rescue of MSV occur at the same rate throughout the virus cycle. The UV inactivation rate for rescue activity was compared with that for the entire MuLV genome, to determine the proportion of that genome necessary for MSV rescue. The MSV rescuing ability of MuLV was inactivated at the same rate as MuLV replicating activity, suggesting that the entire MuLV genome is necessary for rescue. To determine whether rescued MSV aquired envelope antigens from the leukemia virus used for rescue, a specific antiserum was prepared in mice. Results showed that leukemia virus envelope antigens are picked up. Study of revertant S+L- cells revealed that they had greater contact inhibition, lower saturation density, and altered morphology as compared with normal S+L- cells. It is concluded that the MSV in S+L- cells may be defective in many functions necessary for replication as shown by the need for envelope antigen of the helper virus, and the complete MuLV genome being necessary for MSV rescue.

4443 DEMONSTRATION OF HOMOLOGY BETWEEN A MURINE ONCORNAVIRUS GENOME AND RNA CONTAINING LARGE QUANTITIES OF POLYADENYLATE FROM HUMAN LEUKEMIA CELLS.

(Fr.) Larsen, C. J. (St. Louis Hosp., Paris, France), M. Marty, A. Tavitian, R. Hamelin, J. Peries and M. Boiron. *C R Acad Sci* [*D*] (*Paris*) 279:619-622, 1974.

Synthetic DNA complementary to the 70S viral RNA of Moloney murine sarcoma was prepared. It was then incubated for 72 hr with different concentrations of RNA rich in polyadenylic acid which constitutes most of the cellular messenger RNA and therefore is most likely to be the vector of viral information. The RNA was obtained from 12 patients with leukemia and different types of controls. After incubation, the remaining unhybridized DNA was degraded and the amount of hybridization was calculated by means of liquid scintillation counting. In 10 of 12 cases of leukemia, there was a significant amount of hybridization of the synthetic viral DNA and the cellular RNA, but in most of the cases the hybridization was under 5%. In one case it reached 36%. The control RNA showed no hybridization. Further studies are needed to determine definitively whether these RNA sequences are of viral origin.

4444 CHARACTERIZATION OF THE PROTEIN-SYNTHESIZING MECHANISM PRESENT IN ONCORNA VIRUS.

(Ger.) Riman, J. (Inst. Org. Chem. Biochem., Prague, Czechoslovakia), J. Korb, A. Michlova and M. Travnicek. *Arch Geschwulstforsch* 43(2):157-167, 1974.

Sedimentation analysis in a sucrose gradient of virions of avian myeloblastosis virus (AMV) yielded ribosome-like structures in a proportion of one particle per AMV virion. When isolated from relatively young virions, the physical, biochemical and ultrastructural features of these particles were similar to those of ribosome precursors. These virus ribosomes underwent changes reminiscent of the maturation of ribosomes which occurred during the aging of the virus. Absence of the tRNA for glutamic acid, and predominance of tRNAs for lysine, proline and histidine were found in AMV virions; the remaining 12 tRNA species were present in much smaller quantities in AMV than in the cell. The observed accumulation of lysyl-tRNA synthetase activity in the virions is in agreement with the high concentration of lysyl-tRNA molecules.

4445 ISOLATION OF ONCORNAVIRUSES FROM THE BLOOD OF LEUKEMIA PATIENTS. *(Rus.)* Soloviev, V. D. (Inst. Postgrad. Med., Moscow, USSR), T. A. Bektemirov, V. M. Zhdanov, V. Ia. Kitsak, N. V. Khvatova, G. A. Delimbetova, and A. F. Bocharov. *Vopr Virusol* (5):591-596, 1974.

Peripheral leukocytes and bone marrow cells were taken from 41 and 15 patients with acute and chronic leukemia, resp., in an attempt to isolate continuous cell lines and to detect oncornaviruses. Continuous cell lines were not obtained. An increase in the serum concentration to 50% in the medium resulted in the formation of small clusters of surviving fibroblast-like cells. In four instances, the culture fluid of human diploid cells infected with the cells from leukemia patients contained a fraction with 1.16 g/ml buoyant density from which RNA was extracted; it had a sedimentation constant of 60-70 S. Electron microscope studies of ultrathin sections of diploid cells inoculated with cells from the patients revealed type A and B particles. Inoculated diploid cells were not transformed. No virions were found in uninoculated control human diploid cell cultures treated with 5-bromo-2-deoxyuridine or untreated.

4446 ELECTROPHORETIC STUDIES OF THE NUCLEIC ACID IN ONCORNAVIRUSES OF J-96 LYMPHOBLAST CELLS. *(Rus.)* Soloviev, V. D. (Cent. Inst. Postgrad. Med., Moscow, USSR), T. A. Bektemirov, V. Ia. Kitsak, S. A. Moisiadi, E. N. Kantorovich and V. M. Zhdanov. *Vopr Virusol* (5):621-624, 1974.

Molecular weights of viral nucleic acid were investigated electrophoretically in polyacrylamide gels. Total RNA oncornavirus in J-96 lymphoblast cells contained primarily high-molecular weight RNA (6.3-7.0 x 10^6 daltons) identical to 57S RNA in Newcastle disease virus. Components were also detected with medium molecular weights (3.4-4.3 x 10^6 daltons) (37-44S) and with low molecular weights (0.4 x 10^5-1.7 x 10^6 daltons) (4, 7, 10-15, 18 and 28S). It is suggested that the high-molecular RNA is viral nucleic acid.

4447 BIOPHYSICAL PROPERTIES OF THE VIRIONS AND SUBVIRUS COMPONENTS OF TYPE-B ONCORNAVIRUS. *(Rus.)* Bukrinskaia, A. G. (D. I. Ivanovskii Inst. Virol., Moscow, USSR), L. V. Agafonova, A. F. Bykovskii, K. V. Il'in and V. M. Zhdanov. *Vopr Virusol* (3):284-289, 1973.

Studies of type B oncornavirus virions and subvirus components of HEp-2 cells in sucrose density gradients showed the diameter of the virions to be 90-100 nm, and the sedimentation coefficient 400-500 S. The diameter of Sendai virus virions used as a marker was 300 nm; sedimentation coefficient, 700-800 S. The two viruses had similar density in sucrose gradients (1.17-1.18 g/ml for the oncornavirus; 1.18-1.19 g/ml for Sendai virus) and the same density (1.21 g/ml) in cesium chloride density gradients. The action of NP40 nonionic detergent produced structures with 1.27 g/ml density which may be the nucleoids with intact basal membrane. Electron microscope studies demonstrated different morphological structures of the virions and ribonucleoproteins in the two viruses: type B particles had two membranes; Sendai virus, only one. Ribonucleoproteins of the oncornavirus do not form the tubular structures 17 nm in diameter characteristic of Sendai virus. The two viruses revealed a different mode of packing of nucleocapsid protein subunits around the RNA thread.

4448 BIOCHEMICAL METHODS OF RECOGNITION OF LATENT ONCORNAVIRUSES AND MYCOPLASMAS. *(Rus.)* Zhdanov, V. M. (D. I. Ivanovskii Inst. Virol., Moscow, USSR), A. F. Bykovskii, T. A. Bektemirov, K. P. Il'in, N. P. Mazurenko, and A. K. Astakhova. *Vopr Med Khim* 20(4):396-400, 1974.

Studies were performed to evaluate biochemical, biophysical and morphological tests for differentiating type C oncornaviruses, isolated from continuous cell lines of J96, HEp-2 and CaOv from mycoplasmas. The addition of ^{3}H-uridine to culture fluid and the study of such culture fluids in sucrose density gradients revealed substantial amounts of material with 1.16 g/ml density for the HEp-2 culture, less material for the J96 and none for CaOv. All three cultures contained material with a density of 1.22 g/ml. The addition of mitomycin increased the yield of oncornavirus material and inhibited the yield of mycoplasmas. Electron microscopic studies showed that the 1.16 g/ml fractions contained type C virions (J96 and CaOv) and B virions (HEp-2) while 1.22 g/ml fraction contained mycoplasmas. Additional tests included ^{3}H-uridine and ^{14}C-thymidine labelling and the study of DNA and RNA synthesis. The results indicate that both isotopes were included in the mycoplasmas, while the oncornavirus contained only ^{3}H-uridine. The suggested methods proved reliable for differentiating B and C oncornaviruses and mycoplasmas.

4449 INHIBITION ON ONCORNA VIRUS AND CELLULAR DNA POLYMERASES BY NATURAL AND SYNTHETIC POLYNUCLEOTIDES. *(E.)* Srivastava, B. I. S. (Roswell Park Mem. Inst., Buffalo, N.Y.). *Biochim Biophys Acta* 335(1):77-84, 1974.

The relative inhibitory activity of several synthetic and natural ribonucleic acids against four cellular and two viral DNA polymerases was compared. With the exception of poly(rA)-dependent DNA polymerase, all human cellular polymerases tested (3-4S DNA polymerase, 6-7S DNA polymerase, and terminal deoxynucleotidyl transferase) either were not inhibited by poly (A), poly(C), poly(U), tRNA, and ribosomal RNA or were inhibited at much higher concentrations than those required for inhibition of RNA-directed DNA polymerases from murine leukemia virus and feline leukemia virus. Furthermore, thiolated poly(C) and ribosomal RNA were potent inhibitors while still retaining their selectivity against viral RNA-directed DNA polymerase. These results show that natural and synthetic polynucleotides are far more inhibitory to viral enzymes than to cellular enzymes other than poly(rA)-dependent DNA polymerase.

450 CONSECUTIVE ACTIVATION OF A TYPE C RNA AND POLYOMA VIRUS FROM TUMORS INDUCED BY POLY- MA VIRUS-TRANSFORMED RAT CELLS. *(E.)* Rhim, J. S. Microbiol. Assoc. Inc., Bethesda, Md.), Y. Yajima, . Ricklis, R. J. Huebner and R. V. Gilden. *Proc oc Exp Biol Med* 147(3):730-735, 1974.

he replication of type C virus in a polyoma virus- ransformed Fischer rat embryo cell line (R-667-3) as studied in a complement fixation (CF) test with at type C virus group reactive guinea pig serum, in n RNA-dependent DNA polymerase assay using poly rA: liogo dT and by electron microscopy. The R-667-3 ells were highly tumorigenic, inducing tumors in all ewborn Fischer rats inoculated s.c. with 10^6 cells. he cell lines established *in vitro* from these tumors ontained type C virus particles and high levels of NA-dependent DNA polymerase activity. They also ontained polyoma T antigen but not the polyoma iral antigen; they were positive for the major rat pecies-specific antigen (gs-1) in CF tests. One- lay-old tumor cells were grown for 24 hr in the pre- ence of varying concentrations of 5-bromodeoxyuri- line (BrdU). There was no evidence of polyoma virus ynthesis in untreated cultures. In the treated cul- ures, the induction of virus synthesis reached a aximum 6-8 days after exposure of the cells to BrdU; irus synthesis was still evident 20 days after ex- osure. Treatment with BrdU increased the titers f gs-1 antigen and decreased the activity of ribo- ucleic acid-dependent DNA polymerase. Chemical nduction may be useful for the activation and en- ancement of certain RNA and DNA tumor viruses in ormal and malignant human and animal cells.

451 R-TYPE VIRUS IN HAMSTER MELANOMA CELL *IN VIVO* AND *IN VITRO* CONDITIONS. *(E.)* O'- eill, P. J. (Health Cent. Inc., Minneapolis, Minn.), . Valgemae, H. J. Smith and M. Gocken. *Res Commun hem Pathol Pharmacol* 9(4):739-747, 1974.

The Fortner melanotic melanoma No. 1 is a highly pig- ented tumor which gives rise to deeply pigmented cell lines in tissue culture and is negative for vi- rus-like particles both *in vivo* and *in vitro*. Over a 6 yr period of successive transplantation in hamsters, the tumor showed a progressive change from melanotic to amelanotic. Electron microscopic examination of the mixed melanotic/amelanotic tumor revealed virus-like particles resembling R-type virus. The particles were spherical measuring 90-100 mμ in diameter with a central nucleoid of 40-50 mμ from which fine projections radiated toward the outer membrane. The R-viruses were always found in dilated cisternae regardless of cell type. The virus was found in heavy concentrations intertwined with mitrochondria; particles were seen in various stages of budding. Tissue culture cells contained R-virus in about the same concentration as the tumor. Attempts to induce tumors in isologous hamsters by implantation of viable tumor cells enclosed in Millipore chambers were unsuccessful. The number of viable tumor cells within these chambers decreased over a period of months with no significant change in the virus concentration. Cell-free tumor filtrates did not induce tumors when injected into neonatal mice.

4452 PROPERTIES OF ENUCLEATED CELLS: II. CHARACTERISTIC OVERLAPPING OF TRANSFORMED CELLS IS REESTABLISHED BY ENUCLEATES. *(E.)* Pollack, R. (Cold Spring Harbor Lab., N.Y.), R. D. Goldman, S. Conlon and C. Chang. *Cell* 3(1):51-54, 1974.

The established mouse cell line 3T3, the polyoma virus-transformed subline Py3T3, and enucleated cytoplasms prepared from these lines by cytochalasin B treatment were investigated to determine whether enucleated cytoplasms of untransformed and transformed cells responded differently to cell-cell contact. Overlapping of trypsinized, replated cells was determined quantitatively by phase contrast and scanning electron microscopy. Cells of the normal mouse line 3T3 did not overlap one another. Cells of Py3T3 overlapped one another extensively. Trypsinized, replated 3T3 enucleates did not overlap one another, whereas replated enucleates of Py3T3 displayed many overlaps. It is concluded that trypsinized, replated enucleates from normal and transformed cells regenerate the ability to recognize and respond to each other by overlapping or not overlapping, very much as do the cells from which they are derived. It is suggested that it should now be possible to determine whether or not oncogenic agents can increase the overlap index of enucleated 3T3 cells to a detectable value.

4453 THE NATURE OF HEMOPOIETIC STEM CELLS FROM RAUSCHER LEUKEMIA VIRUS INFECTED BALB/c MICE. *(E.)* Van Griensven, L. J. L. D. (Med. Fac. Erasmus U., Rotterdam, Netherlands), H. J. Van Beek and E. Van't Hull. *Biomedicine* 21(8):334-337, 1974.

The spleen colony assay was used to test the bone marrow of Rauscher leukemia virus (RLV)-infected BALB/c mice for proliferative activity 7, 12, 19, and 26 days postinfection. There was no change in the number of spleen colony-forming units (CFU-S) in the bone marrow 7 days after infection. At 12 days, the number of CFU-S had risen from 21.5 ± $8.3/10^5$ living nucleated bone marrow cells (control level) to 59.0 ± 12.4; at 19 and 26 days, the values were 44.6 ± 22.2 and 32.7 ± 15.1, resp. When the total number of CFU-S/femur was calculated, the values again rose at 12 days, but decreased at 26 days. About 90% of the colonies induced by the bone marrow from the RLV-infected mice in irradiated syngeneic mice were well-differentiated. The percentage of erythroid colonies appeared to decrease gradually after day 7, while the percentage of myeloid colonies rose significantly from the beginning of the infectious process and continued to increase throughout the experiment. When determined in absolute numbers, the number of erythroid CFU in the bone marrow increased significantly by day 12; the number of myeloid CFU increased significantly from day 7. This may have been caused either by infection of the pluripotent hemopoietic stem cell or by RLV infection of the irradiated host.

4454 COMBINED INFECTION WITH RAUSCHER VIRUS AND MYCOPLASMA LAIDLAWII IN BALB/cDe MICE. *(Rus.)* Morgunova, T. D. (N. F. Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR), Z. A. Postnikova, I. V. Rakovskaia and G. Ia. Kagan. *Vopr Virusol* (2): 144-148, 1974.

Female BALB/cDe mice (4-7 wk-old) were injected with a mixture of 0.1 ml Rauscher virus (RV) and 0.1 ml *M. laidlawii* broth culture. Monoinfection controls were given 0.1 ml viral injection and 0.1 ml mycoplasma culture medium. The first experiment, using dilution series of 1:200 to 1:12,800, showed that the combined infection resulted in fewer animals developing leukemia and in a lower mortality rate. Thus, in the combined infection, log ID$_{50}$ for RV was 3.72; in the monoinfection, 4.11. The second experiment, using dilution series of 10^{-3} to 10^{-5}, showed that for the 7 wk-old mice the combined infection resulted in an ID$_{50}$ of $10^{-4.17}$ and the monoinfection resulted in an ID$_{50}$ of $10^{-4.75}$. The minimal dose of RV used, 10^{-5}, induced leukemia in 3 of 9 control animals, while none of the experimental mice had leukemia symptoms. The findings indicate that *M. laidlawii* inhibits Rauscher leukemia in BALB/cDe mice. At 8 days of infection, the virus concentration in the plasma decreased considerably. In mice highly resistant to RV (C57BL/6 x A/He)F$_1$, however, *M. laidlawii* increased the level of RV concentration for a short time.

4455 INFECTIOUS ROUS SARCOMA VIRUS AND RETICULOENDOTHELIOSIS VIRUS DNAs. *(E.)* Cooper, G. M. (McArdle Lab. Cancer Res., Univ. Wisconsin, Madison) and H. M. Temin. *J Virol* 14(5):1132-1141, 1974.

Quadruplicate cultures of chicken embryo fibroblasts were treated with twofold serial dilutions of DNA extracted from chicken cells infected with either Schmidt-Ruppin Rous sarcoma virus subgroup D (SR-RSV-D) or Trager duck spleen necrosis virus (TDSNV). Treatment of the recipient cells with DEAE-dextran was required for efficiency assay of infectious viral DNAs. All cultures transformed by DNA from SR-RSV-D-infected cells produced infectious RSV. The morphology of cells transformed by progeny RSV or progeny TDSNV was similar to that of the parental virus. Similar levels of infectivity were observed for DNA extracted from TDSNV-infected chicken and pheasant cells and DNA from chicken spleen cells transformed by reticuloendotheliosis virus T (REV-T). Pheasant and duck cell embryo fibroblasts were also sensitive to infection with DNA extracted from SR-RSV-D- and TDSNV-infected chicken cells. The specific infectivities of the viral DNAs corresponded to one infectious U/10^5 to 10^6 viral DNA molecules. Infection with viral DNA followed one-hit kinetics, indicating that the viral DNA is integrated into host DNA as a single unit of DNA, rather than as two or more unlinked units. The minimal size of infectious RSV DNA was approximately 6 million daltons, whereas the minimal size of infectious REV DNA was 10-20 million daltons.

4456 REQUIREMENT FOR CELL DIVISION FOR INITIATION OF TRANSCRIPTION OF ROUS SARCOMA VIRUS RNA. *(E.)* Humphries, E. H. (McArdle Lab., Univ. Wisconsin, Madison) and H. M. Temin. *J Virol* 14(3): 531-546, 1974.

Chicken embryo fibroblasts were synchronized by depleting the serum-containing medium of multiplication-stimulating activity, after which the stationary cells were exposed to Rous sarcoma virus (RSV) and division was stimulated by the addition of serum. The amount of RSV-specific RNA present at different times after the addition of serum was determined by RNA-DNA hybridization in the presence of excess RNA. The stationary fibroblasts did not synthesize viral RNA until after they started dividing. Initiation of RNA transcription after cell division resulted in transcription of the entire viral genome and was shortly followed by the appearance of progeny virus. The addition of colchicine to the RSV-infected stationary fibroblasts resulted in the inhibition of cell division and a 24-hr delay in the appearance of viral RNA. RSV-infected cells made stationary 10-15 cell generations after infection continued to produce progeny virus in quantities similar to those produced in dividing RSV-infected cells. The virus produced by the cells made stationary after virus production had begun contained RNA synthesized in stationary cells. Therefore, division of the RSV-infected chicken embryo fibroblast is required for the initiation but not the maintenance, of viral RNA transcription.

4457 THE PERSISTENCE AND EXPRESSION OF VIRUS-SPECIFIC DNA IN REVERTANTS OF ROUS SARCOMA VIRUS-TRANSFORMED BHK-21 CELLS. *(E.)* Deng, C. T. (Dep. Microbiol., Univ. California, San Francisco), D. Boettiger, I. MacPherson and H. E. Varmus. *Virology* 62(2):512-521, 1974.

Clones of Rous sarcoma virus-transformed baby hamster kidney cells and subclones reverted to normal phenotype were found to contain one copy of integrated virus-specific DNA/diploid cell. In the transformed clones, virus-specific DNA was transcribed into RNA at low levels similar to those observed in other nonpermissive RSV-transformed cells. Virus-specific RNA concentrations were still lower in the revertant clones. The amount of virus-specific RNA in these clones correlated with the frequency with which Rous sarcoma virus could be rescued after fusion with chick embryo cells. Treatment of a revertant clone with 5-bromodeoxyuridine (25 μg/ml) increased the concentration of viral RNA and the frequency of rescue. These results suggest that control of viral gene expression in reverted cells is at least partially regulated at the transcriptional level.

4458 TRANSFORMATION OF CHICK EMBRYO NEURORETINAL CELLS BY ROUS SARCOMA VIRUS *IN VITRO*: INDUCTION OF CELL PROLIFERATION. *(E.)* Pessac, B. (Broussais Hosp., Paris, France) and G. Calothy. *Science* 185(4152):709-710, 1974.

Neuroretinal cells from 7-day-old chick embryos were transformed and induced to proliferate up to 12 doublings after infection with Rous sarcoma virus *in vitro*. Morphological transformation was evident in the neuroretinal cells within 36 hr after infection. Rous sarcoma virus production could be detected in the medium at 24 hr and titers of about 10^6 focus-forming U/ml were reached by day 5 or 6. Susceptibility of neuroretinal cells to virus infection is also dependent on the stage of development, since nfection of cells from 10-day-old embryos results n no morphological transformation, no cell multipli- ation, and only minimal virus replication.

4459 TRANSCRIPTION OF DNA FROM THE 70*S* RNA OF ROUS SARCOMA VIRUS. I. IDENTIFICATION OF A SPECIFIC 4*S* RNA WHICH SERVES AS PRIMER. *(E.)*

Dahlberg, J. E. (Dept. Physiol. Chem., U. Wisconsin, Madison), R. C. Sawyer, J. M. Taylor, A. J. Faras, W. E. Levinson, H. M. Goodman and J. M. Bishop. *J Virol* 13(5):1126-1133, 1974.

The enzymatic transcription of DNA from the 70S RNA of Rous sarcoma virus (RSV) is initiated on the 3' terminus of a molecule of 4S RNA which is hydrogen bonded to the viral genome. This primer was labeled with radioactive deoxynucleotides, after which its release from 70S RNA by thermal denaturation was shown to be accompanied by a reduction in the template activity of the viral RNA. Two-dimensional electrophoresis in polyacrylamide gels separated the 4S RNAs associated with the 70S RNA of RSV into approximately eight fractions, each of which appeared to contain a discrete species of tRNA. The RNA in one of these fractions served as the principal primer for the initiation of DNA synthesis by both detergent-disrupted virions of RSV and purified RNA-directed DNA polymerase; in each case, RSV 70S RNA served as template.

4460 INDUCTION OF SARCOMAS IN STRIPED HAIRY-FOOTED HAMSTERS (*PHODOPUS SUNGORUS*) USING ROUS SARCOMA VIRUS (CARR-ZILBER STRAIN). *(Rus.)*

Markarian, D. S. (Inst. Exp. Pathol. Ther., Sukhumi, USSR), F. I. Adzhigitov and D. A. Gubeladze. *Vopr Virusol* (2):137-139, 1974.

Susceptibility of striped hairy-footed hamsters (*Phodopus sungorus*) to the Carr-Zilber strain of Rous sarcoma virus (RSV) was studied in 66 mature animals injected s.c. with 0.5 ml RSV filtrate (5 x 10^8 chick tumor dose). In the 1st experiment, 35 animals were injected in the tail, with 18 (51.5%) developing tumors; in the 2nd, 31 animals were given injections in the neck and tail, with 16 (51.6%) developing tumors. In all the animals except one the tumors developed from the subcutaneus tissue. No metastatic spread was observed. In 60% of the animals the tumor growth led to the death of the host 39-130 days after the RSV injection. Histologically, the tumors were classified as poorly-differentiated dermal sarcomas with prevailing round-cell elements. The results indicate that the striped hairy-footed hamster, having a "convenient" karyotype of 28 chromosomes, is a valuable model for studies of viral carcinogenesis.

4461 TRANSCRIPTION OF DNA FROM THE 70*S* RNA OF ROUS SARCOMA VIRUS. II. STRUCTURE OF A 4*S* RNA PRIMER. *(E.)*

Faras, A. J. (Dept. Microbiol. U. California, San Francisco), J. E. Dahlberg, R. C. Sawyer, F. Harada, J. M. Taylor, W. E. Levinson, J. M. Bishop and H. M. Goodman. *J Virol* 13(5):1134-1142, 1974.

The 70S RNA of Rous sarcoma virus contains 4S RNAs which serve as primers for the initiation of DNA synthesis *in vitro* by the RNA-directed DNA polymerase of the virus. These primers were purified in three different ways: by isolation of the covalent complex between primer and nascent DNA; by differential melting of the 70S RNA; and by two-dimensional electrophoresis in polyacrylamide gels. The 4S RNAs purified by these procedures were homogeneous and possessed very similar if not identical nucleotide compositions and sequences. The RNAs were approximately 75 nucleotides long, had pG at the 5' terminus and CpCpA$_{OH}$ at the 3' terminus, and contained a number of minor nucleotides characteristic of tRNA. In contrast to most RNA's, the primer lacked rTp and contained Gp (Ψp, Ψp, Cp) Gp (possibly in place of the characteristic sequences GprTpΨpCpGp). At least 50% of the 4S primers available on the 70S RNA were utilized in a standard polymerase reaction *in vitro*. The results indicate that the primer RNA is probably a tRNA and support the hypothesis that both primer *per se* and 4S RNA which is hydrogen bound to 70S RNA in general are derived from a population of free 4S RNA during the maturation of genome subunits into their final 70S form.

4462 FIBRINOLYSIS ASSOCIATED WITH ONCOGENIC TRANSFORMATION: PARTIAL PURIFICATION AND CHARACTERIZATION OF THE CELL FACTOR, A PLASMINOGEN ACTIVATOR. *(E.)*

Unkeless, J. (Rockefeller U., New York, N.Y.), K. Dano, G. M. Kellerman and E. Reich. *J Biol Chem* 249(13):4295-4305, 1974.

The cell factor which is involved in tumor-associated fibrinolysis was partially purified from the supernatant fluid of chicken embryo fibroblast cultures transformed by Schmidt-Ruppin virus. The cell factor is an arginine-specific protease which acts as a plasminogen activator. The molecular wt is approximately 39,000 and the irreversible inhibitory effect of diisopropyl fluorophosphate suggests that it is a serine enzyme. The cell factor which is detected in the supernatant culture fluid also occurs in a cell-associated form in transformed, but not normal, cells. This form is tightly bound in a postnuclear cellular particular fraction and can be solubilized by sodium dodecyl sulfate or Triton X-100. The cell factor activated plasminogen by proteolytic cleavage, and it acts preferentially on one of two electrophoretic classes of plasminogen molecules found in chicken plasma. Since the cell factor was only partially purified and is available only in catalytic amounts, the conclusions drawn are only tentative; purification of substantial amounts is thus a practical goal for future efforts.

4463 ENHANCING EFFECT OF GREEN MONKEY KIDNEY CELL EXTRACT ON THE TRANSFORMATION OF MOUSE CELLS BY SV40. *(E.)*

Hagiwara, A. (Natl. Inst. Health, Tokyo, Japan) and T. Kitahara. *Int J Cancer* 14(1):26-31, 1974.

Simian virus (SV40) transformation of mouse C3H-2K cells was carried out in the presence or absence of extracts of green monkey kidney (GMK) cells. C3H-2K cells in suspension were infected with either crude or purified SV40 at an input multiplicity of infection ranging from 2.4-80 or from 9-900 plague-forming

U/cell, resp. Transformed colonies were counted after 2 wk. The GMK cell extract sharply increased the transformation efficiency obtained with both crude or purified SV40. At the highest concentration of the crude virus, the transformation frequency was 0.33 and 0.07% in extract-treated and untreated cells, resp. With purified virus, the frequency at the highest concentration was 4.19% in extract-treated and 0.13% in untreated cells. Colonies in soft agar continued to grow for 2 wk after colony count, and cells subcultured from colonies in nutrient agar had SV40 antigen. Extracts from human embryonic lung, mouse embryo, or hamster embryo cells also enhanced the frequency of transformation of C3H-2K cells by SV40. The activity of the GMK extract was sensitive to trypsin, but not DNase, RNase, or heating at 56 C for 30 min. The extract did not facilitate virus adsorption, uncoating, and T antigen formation, suggesting that the enhancing factor(s) acts on steps other than these early infectious processes.

4464 CYCLIC ADENOSINE 3':5'-MONOPHOSPHATE METABOLISM IN NORMAL AND SV40-TRANSFORMED WI-38 CELLS. *(E.)* Kelly, L. A. (Sch. Med., Univ. Massachusetts, Worcester), M. S. Hall and R. W. Butcher. *J Biol Chem* 249(16):5182-5187, 1974.

Intact simian virus 40-transformed WI-38 cells (VA13-2RA) responded to catecholamines, prostaglandins, and adenosine with much more dramatic increases in cyclic AMP than did normal cells, which had slightly higher basic cyclic AMP levels. The catecholamine responses of the VA13-2RA cells were independent of population density, whereas the responses of WI-38 cells diminished as they approached confluence. Time course studies showed that the maximal intracellular cyclic AMP levels in response to prostaglandin E_1 were reached much later in the transformed cells than in the normal cells. Further, the rapid decline in cellular cyclic AMP in WI-38 cells was markedly attenuated in VA13-2RA cells. Theophylline enhanced the response of WI-38 cells to prostaglandins and reduced cyclic AMP accumulation in the media; in VA13-2RA cells the effects of theophylline were very minor. Adenylate cyclase activities in cell-free preparations of WI-38 and VA13-2RA cells differed. Although WI-38 homogenates were more active than VA13-2RA preparations in the presence of prostaglandin E_1 (10 μM) and NaF (10 mM), VA13-2RA activity exceeded WI-38 activity more than 3-fold in the presence of epinephrine (10 μM). Epinephrine also increased cyclic AMP production in VA13-2RA homogenates more than NaF did. The WI-38 homogenates had a much higher 3':5'-monophosphate phosphodiesterase activity than the VA13-2RA preparations (131 ± 8 *versus* 7.1 ± 5.4 nM of cyclic AMP destroyed/mg protein/30 min).

4465 DNA SYNTHESIS IN RESTING AFRICAN GREEN MONKEY KIDNEY CELLS INFECTED WITH DEFECTIVE SV40. *(E.)* Kato, K. (Natl. Inst. Health, Kaminosaki, Tokyo, Japan), S. Watanabe, K. Yoshiike and S. Uchida. *J Gen Virol* 24(3):425-431, 1974.

Resting African Green monkey kidney (GMK) cell cultures were infected with defective particles of simian virus 40 (SV40) strain 777 (small-plaque). The pattern of induced DNA synthesis after infection of the GMK cells with defective SV40 (0.01 and 0.1 plaque-forming U) was similar to that after infection with standard SV40 (1 and 10 plaque-forming U) indicating that at least some of the defective mutants were able to induce DNA synthesis in resting GMK cells. Similar results were obtained in cells infected with defective or nondefective virus in the presence of a low dose of actinomycin D. Most of the DNA synthesized during the early stage of infection in cells infected with defective or nondefective virus appeared to be cell DNA which sedimented faster than viral DNA in neutral CsCl density gradients. The sedimentation patterns of DNA synthesized in later stages of infection indicated that the defective mutants are able to direct the synthesis of viral DNA. However, infection with defective SV40 results in the production of defective DNA molecules which are somewhat shorter and slightly more heterogeneous than complete SV40 DNA molecules.

4466 REPLICATION OF SIMIAN VIRUS 40 IN PERMISSIVE CELLS: ASSEMBLY OF VIRUS COMPONENTS. *(E.)* Tan, K. B. (Wistar Inst. Anat. Biol., Philadelphia, Pa.) and F. Sokol. *J Gen Virol* 25(1):37-51, 1974.

Incubation of monkey kidney cells infected with simian virus 40 in medium lacking arginine resulted in a marked inhibition of production of both infectious virus and empty capsids. Virus DNA synthesis and formation of a virus DNA-protein complex were unaffected. All the virus structural polypeptides were made, although in reduced amounts (42%) when compared with infected cells incubated in medium containing arginine. All the newly synthesized virus proteins were found in the nuclei of arginine-deprived cells. Addition of arginine to arginine-deprived cells resulted in the assembly of pre-synthesized virus components into infectious virus and empty capsids, as well as the production of virus from virus proteins and DNA synthesized after the addition of arginine. Studies with inhibitors of protein and DNA synthesis suggested that two late virus functions were affected in the absence of arginine: the assembly of capsids and the encapsidation of DNA by capsids to form infectious virus.

4467 SUPPRESSION OF SV40 TUMORS AFTER IMMUNIZATION WITH GROUP A *STREPTOCOCCUS PYOGENES* AND *BORDETELLA PERTUSSIS*. *(E.)* Collins, J. L. (Dept. Microbiol., U. Tennessee, Knoxville) and C. J. Wust. *Cancer Res* 34(5):932-937, 1974.

Tumors developed within 14 wk in 18 of 19 golden Syrian hamsters injected s.c. with 1 X 10^4 cells of a simian virus 40-transformed cell line. Among 16 animals immunized with a mixed vaccine of Group A *Streptococcus pyogenes* and *Bordetella pertussis* (6 i.p. injections), only eight developed tumors. Tumor growth was also suppressed in 50% of animals immunized with *S. pyogenes* vaccine alone. Polysaccharides were extracted from *S. pyogenes* and tumor cells by an identical procedure. Antibody titers to these polysaccharides were measured and were found to be depressed in both tumor-bearing and supressed animals during the period when tumors were rapidly growing in tumor-bearing animals. Antibody to tumor polysaccharide reacted with tumor and *S. pyogenes* polysaccharides. Such antibody was found in sera and also could be eluted from tumors. The ligands, *N*-acetyl-D-glucosamine and L-rhamnose, which are the major constituents of the cell wall of *S. pyogenes*, did not bind with any serum. There was a significantly lower level of sialoglycoprotein in the sera of tumor-bearing animals than was found in that of control animals.

4468 CYCLIC AMP LEVELS IN TEMPERATURE SENSITIVE SV40 TRANSFORMED CELL LINES.

(E.) Burstin, S. J. (New York U. Sch. Med., N.Y.), H. C. Renger and C. Basilico. *J Cell Physiol* 84(1):69-74, 1974.

The binding protein assay and the immunoprecipitation method were used to determine the intracellular levels of cyclic AMP (cAMP) in temperature-sensitive simian virus 40 (SV40)-transformed 3T3 cells (ts SV3T3). The results were compared with those obtained in the parental 3T3 cell line and wild-type SV40 transformants of 3T3. The cAMP levels in the parental 3T3 cells were higher than those in two SV40 transformants, and the levels in confluent cultures of the two transformants were lower than those in sparse cultures of the same cell lines. The cAMP levels in the transformed cell lines did not vary with temperature, while those in the parental line did. The ts SV3T3 cell lines had lower cAMP levels than the parental 3T3 cells, although two of the temperature-sensitive lines had higher cAMP levels than one of the SV40 transformants. The cAMP levels in the temperature-sensitive lines were not temperature dependent. Retransformation of these cell lines by murine sarcoma virus did not markedly affect their cAMP levels.

4469 ENHANCEMENT OF SIMIAN VIRUS 40 TRANSFORMATION AND INTEGRATION BY 4-NITROQUINOLINE 1-OXIDE.

(E.) Hirai, K. (Wistar Inst. Anat. Biol., Philadelphia, Pa.), V. Defendi and L. Diamond. *Cancer Res* 34(2):3497-3500, 1974.

Chinese hamster embyro cells were treated with 4-nitroquinoline 1-oxide (4NQO) (0.4 μg/ml) for 2 hr prior to infection with simian virus 40 (SV40) and were subcultured 24 hr later to bring both treated and untreated cultures to the same density. After another 24 hr of incubation, the cell DNA was separated from the SV40 DNA and hybridized with SV40 complementary ^{3}H-RNA. The number of "integrated" SV 40 genome equivalents (Eq)/diploid cell at 48 hr postinfection was greater in the 4NQO-treated cells than in the untreated SV40-infected cells. When ^{3}H-thymidine was added to the 4NQO-treated cultures, there was no detectable synthesis of new SV40 DNA; thus, it is unlikely that 4NQO treatment rendered the nonpermissive cells permissive for viral DNA replication, thereby increasing the number of SV40 DNA molecules available for integration. RNA-DNA hybridization showed that 4NQO pretreatment enhanced penetration of SV40 into cell nuclei. The amount of SV DNA/nucleus of 4NQO-pretreated cells was twice as high as the amount in the nuclei of untreated cells. 4NQO induced a 2- to 8-fold increase in SV40 transformation frequency, as determined by colony-forming efficiency in liquid medium. The increased number of genome Eq in 4NQO-treated cells is compatible with the hypothesis that the strand scission of cell DNA produced by 4NQO facilitates integration.

4470 PROPERTIES OF SV40 RESCUED FROM ACTINOMYCIN D-SENSITIVE AND ACTINOMYCIN D-RESISTANT TRANSFORMED HAMSTER CELLS. II. TRANSFORMING CAPACITY, ONCOGENICITY, TSTA INDUCTION.

(E.) Wicker, R. (Inst. Res. Sci. Cancer, Villejuif, France), R. Cassingena, E. G. Suarez, S. Estrade, C Lavialle and P. Lazar. *Arch Gesamte Virusforsch* 46(3/4):217-228, 1974.

The transforming capacity, oncogenicity, and ability to form tumor-specific antigens of two rescued strains of simian virus 40 (SV40) were investigated. The strains were a small plaque variant rescued from actinomycin-D-resistant hamster cells (TSV-5 Cl.2/R) and a large plaque variant from actinomycin-D-sensitive cells (TSV-5 Cl.2). Transformation capacity was determined by colonial morphology in HK (Syrian golden hamster kidney), MK (mouse kidney), and BSC-1 cells. Oncogenicity was determined by s.c. innoculation of newborn Syrian golden hamsters. To test for induction of tumor specific transplantation antigens, weanling golden hamsters were immunized with either virus administered twice at a 2-wk interval. After 14 days the animals were challenged with SV40 transformed cells and tumor incidence was calculated. The transforming ability of the small plaque variant was found to be 4-5 times higher than the large plaque in all cell types. The oncogenicity test of the small plaque virus demonstrated a 2-wk shorter latency period and a significantly higher percentage of tumors. The small plaque virus was also found to be less immunogenic than the large plaque.

4471 SIMIAN VIRUS 40-HOST CELL INTERACTIONS. II. CYTOPLASMIC AND NUCLEOLAR ACCUMULATION OF SIMIAN VIRUS 40 VIRION PROTEIN.

(E.) Widmer, C. (Dep. Pathol., Univ. California San Diego, La Jolla) and J. A. Robb. *J Virol* 14(6):1530-1546, 1974.

Immunofluorescence was used in parallel with transmission and scanning electron microscopy to characterize the unusual cytoplasmic and nucleolar accumulation of simian virus 40 (SV40) virion protein (C antigen) at restrictive temperatures (39-41 C) in monkey cells infected with a temperature-sensitive mutant of SV40 defective in virion assembly (tsB11). Cytoplasmic and nucleolar accumulation of C antigen did not occur in wild-type-infected cells at any temperature and wild-type and tsB11-infected cells were not distinguishable at 33 C by immunofluorescence or electron microscopy. The transport of C antigen from the nucleolus and cytoplasm into the nucleus was complete after a temperature shift-down (41 and 39 to 33 C). Limited virus particle formation occurred after the shift-down in the presence of actinomycin D and cycloheximide, indicating that some of the 39-41 C synthesized virion protein could be used for capsid assembly at 33 C in the absence of further virion protein synthesis. There was a continuous requirement for the tsB11 mutant function. The virion protein synthesized at 33 C remained confined to the nucleus when the cells were shifted to 39 and 41 C in the presence of actinomycin D or cycloheximide. In the presence of cytosine arabinonucleoside, however, the virion protein accumulated in large aggregates in the nucleus and nucleolus after the shift-up but did not migrate into the cytoplasm as it did in drug-free tsB11-infected control cells. Microtubular transport appeared to play little if any role in the abnormal transport of tsB11 virion protein from cytoplasm to nucleus. Although virus particles were never observed by electron microscopy and V antigen was not detected by immunofluorescence at 39 or 41 C in the tsB11-infected cells, dense amorphous accumulations were formed in the nucleoli and cytoplasm. The tsB11 function appears to be continuously required for the normal transport of SV40 virion protein between the cytoplasm, nucleolus, and nucleus and for the assembly of capsids and virions. One of the virion proteins may also be involved in some presently undetermined nucleolar function during SV40 productive infection.

4472 SYNTHESIS OF SIMIAN VIRUS 40 DNA IN ISOLATED NUCLEI. *(E.)* Qasba, P. K. (Natl. Cancer Inst., Bethesda, Md.). *Biochem Biophys Res Commun* 60(4):1338-1344, 1974.

The maturation of 3-7S simian virus 40 (SV-40) DNA fragments into long chains was studied in nuclei isolated in the presence of Ca^{++}. Secondary African Green monkey kidney cells were infected with the virus, and the nuclei were isolated at 4 C in isotonic buffer containing 0.5 mM $CaCl_2$. Controls contained no $CaCl_2$. After incubation the nuclei were centrifuged in an alkaline sucrose gradient and ^{14}C-labeled SV40 components were counted by scintillation counter. DNA synthesis continued for 20-30 min in the Ca^{++} isolated nuclei while it stopped after 5-7 min in the controls. The synthesized viral DNA from nuclei isolated in the presence of Ca^{++} sedimented mostly as long chains (7-16S); 60% of the synthesized DNA isolated in the absence of Ca^{++} sedimented as 3-7S fragments and the rest as 7-16S. Synthesis in the 7-16S range plus the extended synthesis time led to the conclusion that the 3-7S fragments were maturing into longer chains in Ca^{++} isolated nuclei. This was confirmed by pulse-chase experiments.

4473 SIMIAN SARCOMA VIRUS: ONCOGENICITY, FOCUS ASSAY, PRESENCE OF ASSOCIATED VIRUS, AND COMPARISON WITH AVIAN AND FELINE SARCOMA VIRUS-INDUCED NEOPLASIA IN MARMOSET MONKEYS. *(E.)* Deinhardt, F. (Rush-Presbyterian-St. Luke's Med. Cent., Chicago), L. Wolfe, R. Massey, J. Hoekstra and R. McDonald. *Bibl Haematol* (39):258-262, 1973.

Simian sarcoma virus type 1 (SSV-1)-induced tumors from two of three marmoset monkeys, two tumor cell culture lines established from biopsies from SSV-1-inoculated monkeys, and marmoset cells transformed *in vitro* by SSV-1 all contained typical C-type budding virions. Cell extracts and cell-free supernatants from the tumor cell lines and the cells transformed *in vitro* consistently induced typical foci in marmoset indicator cells; the foci increased slowly in size and did not readily form satellite foci. When cell cultures previously inoculated with dilutions of SSV-1 which no longer induced foci were challenged with 100 focus-forming U of the same SSV-1 preparations, focus formation was considerably reduced or eliminated, indicating the presence of a large excess of an interfering agent. Sera of marmosets bearing SSV-1 induced tumors stained group specific (gs) antigen in cells derived from their own tumors as well as in cells transformed *in vitro* by SSV-1 and cells carrying feline leukemia virus. The sera did not stain antigen in cells transformed by Rous sarcoma virus. The gs antigen in the SSV-1-transformed cells was stained by anti-feline sarcoma virus-gs antibodies.

4474 ISOLATION AND CHARACTERIZATION OF REVERTANT CELL LINES. VI. SUSCEPTIBILITY OF REVERTANTS TO RETRANSFORMATION BY SIMIAN VIRUS 40 AND MURINE SARCOMA VIRUS. *(E.)* Vogel, A. (Cold Spring Harbor Lab., N.Y.) and R. Pollack. *J Virol* 14(6): 1404-1410, 1974.

The equilibrium of the viral and cellular genomes in simian virus 40 (SV40)-transformed 3T3 cells was investigated by reinfection of the cells with either SV40 or Kirsten sarcoma virus (SV)(R-MLV). Serum-sensitive and density-sensitive revertant cells were each infected with each virus and the resulting cell characteristics were studied. Neither of the revertant groups were retransformable by SV40, but both groups were transformed by the Kirsten SV, the cells becoming round and spindly. The density-sensitive group became able to grow in high cell densities and to form colonies in methyl cellulose suspension; the serum sensitive group, in contrast, did not regain the ability to grow in low serum concentrations. No reduction in chromosome number accompanied the transformation. It is concluded that genome equilibrium in SV40-transformed 3T3 cells is not at the expense of the cell's phenotypic expression, and that the two types of virus do not have the same effect on the cell.

4475 GEL ELECTROPHORESIS, ISOELECTRIC FOCUSING, AND LOCALIZATION OF THYMIDINE KINASE IN NORMAL AND SIMIAN VIRUS 40-INFECTED MONKEY CELLS. *(E.)* Kit, S. (Baylor Coll. Med., Houston, Tex.), W. C. Leung, D. Trkula, D. R. Dubbs and G. Jorgensen. *Intervirology* 2:137-151, 1973/74.

Following simian virus 40 (SV40) infection of CV-1 monkey cells, cytosol thymidine (dT) kinase activity increased 4- to 10-fold. This enzyme was not significantly different from the cytosol dT kinase of uninfected cells with respect to disc polyacrylamide gel electrophoresis mobility, isoelectric point, sedimentation coefficient, and phosphate donor specificity. Monkey mitochondria contain a distinctive dT kinase isozyme localized in the mitochondrial matrix. This mitochondrial isozyme had a higher electrophoretic mobility, lower isoelectric point, and smaller sedimentation coefficient than that of cytosol dT kinase, and could utilize either ATP or idine triphosphate; it did not increase after SV40 nfection. Mitochondria also contained a cytosol-ike dT kinase which was enhanced in infected cells. ese findings suggest that SV infection derepresses e normal cytosol of dT kinase of host cells.

476 THE SV40-INDUCED T-ANTIGEN IN MOUSE CELLS. *(E.)* Fischer, H. (German Cancer Res. ent., Heidelberg, West Germany). *FEBS Lett* 43(2): 19-222, 1974.

-antigen was precipitated in a protein preparation f simian virus (SV)-transformed 3T3 cells. The ells were harvested in reticulocyte standard bufer, sonified, and centrifuged at 100,000 g. The 00,000 g supernatant was incubated with anti-T seum from hamsters bearing SV40-induced tumors and ubsequently with rabbit anti-hamster serum. Folowing incubation, the supernatant was centrifuged t 3000 g for 30 min. Sodium dodecyl sulfate-polycrylamide gel electrophoresis of the antigen comlex revealed two peaks with molecular wt of about 0,000 and 30,000. The peaks are defined by the pecificity of the anti-T serum and assumed to be ubunits of the SV40 T-antigen. A similar polyacrylmide gel pattern was seen with normal 3T3 cells recipitated with anti-T serum. No precipitate was btained with protein preparations from SV3T3 and T3 cells incubated with serum from normal hamsters.

477 DEMONSTRATION BY REVERSED-PHASE CHROMATOGRAPHY, OF UNIQUE 4S RNA SPECIES ASSOCIATED WITH THE 70S RNA OF TUMOR VIRUSES. *(E.)* Waters, L. C. (Biol. Div., Oak Ridge Natl. Lab., Tenn.), B. C. Mullin, T. Ho and W. K. Yang. *Fed Proc [II]* 33(5):1604, 1974.

4478 MOLECULAR ASPECTS OF THE INTEGRATION AND DEPRESSION OF ONCOGENIC VIRAL GENOMES. *(E.)* Frenster, J. H. (Stanford Univ. Sch. Med., Calif.). *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:19-20, 1973.

4479 ATTEMPTS TO ISOLATE VIRUS FROM HUMAN BRAIN TUMORS. *(E.)* Yabe, Y. (Okayama Univ. Med. Sch., Japan). *Acta Med Okayama* 28(4):247-252, 1974.

4480 VIRAL INVOLVEMENT IN THE DIFFERENTIATION OF ERYTHROLEUKEMIC MOUSE AND HUMAN CELLS. *(E.)* Ostertag, W. (Max-Planck-Inst. Exp. Med., Gottingen, West Germany), T. Cole, T. Crozier, G. Gaedicke, J. Kind, N. Kluge, J. C. Krieg, G. Roesler, G. Steinheider, B. J. Weimann and S. K. Dube. *Proc Fourth Int Symposium Princess Takamatsu Cancer Res Fund, Tokyo* pp. 485-512, 1973.

4481 EVIDENCE IN SUPPORT OF A DNA INTERMEDIATE IN THE REPLICATION OF AVIAN RNA TUMOR VIRUSES. *(E.)* Baluda, M. A. (Sch. Med., Univ. California, Los Angeles). *Collect Pap Annu Symp Fundam Cancer Res* 25:313-332, 1974.

4482 EVOLUTION OF THE CARCINOGENIC VIROGENETIC CODE. *(E.)* Valladares, Y. (Natl. Inst. Oncol., City Univ., Madrid, Spain) and Y. Alvarez. *Microbios* 11(42/43):87-105, 1974.

4483 PROTECTION OF AVIAN MYELOBLASTOSIS VIRUS (AMV) DNA POLYMERASE BY SUBSTRATES AGAINST HEAT INACTIVATION. *(E.)* Papas, T. S. (Natl. Cancer Inst., Bethesda, Md.), M. A. Chirigos and J. G. Chirikjian. *Nucleic Acids Res* 1(11):1399-1410, 1974.

4484 COMPLEMENTARY STRAND-SPECIFIC SEQUENCES FROM UNIQUE FRAGMENTS OF ADENOVIRUS TYPE 2 DNA FOR HYBRIDIZATION-MAPPING EXPERIMENTS. *(E.)* Tibbetts, C. (Dep. Microbiol., Uppsala Univ., Sweden) and U. Pettersson. *J Mol Biol* 88(3):767-784, 1974.

4485 BRAIN TUMORS INDUCED IN RATS BY HUMAN ADENOVIRUS TYPE 12. *(E.)* Murao, T. (Okayama Univ. Med. Sch., Japan), H. Ohmori, H. Sonobe, K. Matsuo, A. Tsutsumi and K. Ogawa. *Acta Med Okayama* 28(1):47-58, 1974.

4486 EFFECT OF IMMUNIZATION WITH FETAL CELLS ON ADENOVIRUS-12 ONCOGENESIS. *(E.)* Abe, S. (Okayama Univ. Med. Sch., Japan). *Acta Med Okayama* 28(3):147-158, 1974.

4487 A COMPLEMENT-FIXATION TEST FOR THE BOVINE LEUKEMIA (C-TYPE) VIRUS. *(E.)* Miller, J. M. (Natl. Anim. Dis. Cent., Ames, Iowa) and M. J. Van Der Maaten. *J Natl Cancer Inst* 53(6):1699-1702, 1974.

4488 RIBONUCLEOTIDE TERMINAL TRANSFERASE ACTIVITIES IN MURINE TYPE-C RNA TUMOR VIRUSES. *(E.)* Thomassen, M. (Bionetics Res. Lab., Bethesda, Md.), E. Kingsley, K. Ohe and A. M. Wu. *Fed Proc [II]* 33(5):1603, 1974.

4489 ERYTHROID HYPOPLASIA IN CATS INOCULATED WITH FELINE LEUKEMIA VIRUS. *(E.)* Hoover, E. A. (Coll. Vet. Med., Ohio State Univ., Columbus), G. J. Kociba, W. D. Hardy, Jr. and D. S. Yohn. *J Natl Cancer Inst* 53(5):1271-1276, 1974.

4490 FRIEND LYMPHATIC LEUKEMIA VIRUS-INDUCED AUTOIMMUNE HEMOLYTIC ANEMIA WITH GLOMERULONEPHRITIS IN THE RAT. *(E.)* Kuzumaki, N. (Hokkaido Univ. Sch. Med., Sapporo, Japan), T. Kodama, N. Takeichi and H. Kobayashi. *Int J Cancer* 14(4):483-492, 1974.

4491 BUDDING OF FROG VIRUS 3 STUDIED BY IMMUNOLOGICAL AND CYTOCHEMICAL METHODS IN ELECTRON MICROSCOPY. *(E.)* Tripier, F. (Fac. Med., Univ. Louis Pasteur, Strasbourg, France), J. Braunwald, L. Markovic and A. Kirn. *Intervirology* 3(5/6):305-318, 1974.

4492 BONE LESIONS IN CATS WITH ANEMIA INDUCED BY FELINE LEUKEMIA VIRUS. *(E.)* Hoover, E. A. (Coll. Vet. Med., Ohio State Univ., Columbus) and G. J. Kociba. *J Natl Cancer Inst* 53(5):1277-1284, 1974.

4493 MAJOR ENVELOPE AND INTERNAL PROTEINS OF FELINE ONCOGENIC RNA VIRUSES. *(E.)* Pal, B. K. (Univ. South. California Sch. Med., Los Angeles) and P. Roy-Burman. *Fed Proc [II]* 33(5):1603, 1974.

4494 MUCOPOLYSACCHARIDES IN THE SPLEEN OF MICE WITH FRIEND LEUKEMIA. *(E.)* Seno, N. (Dep. Chem., Ochanomizu Univ., Tokyo, Japan), H. Masuhara, S. Nagase and K. Anno. *Gann* 65(5):451-454, 1974.

4495 X-RAYS, INFLUENZA AND LEUKEMIA: AN EXAMINATION OF THE OXFORD STUDY OF CHILDHOOD CANCERS. *(E.)* Landau, E. (Food Drug Adm., Rockville, Md.), A. Steward and J. F. Bithell. *Radiat Res* 59(1):103, 1974.

4496 ELECTRON MICROSCOPIC OBSERVATIONS ON HEPATITIS B ANTIGEN-ASSOCIATED PARTICLES IN THE SERA OF PATIENTS WITH VARIOUS LIVER DISEASES. *(E.)* Yamada, G. (Okayama Univ. Med. Sch., Japan). *Acta Med Okayama* 28(1):27-45, 1974.

4497 LYMPHOMAS INDUCED IN MONKEYS BY EPSTEIN-BARR, SAIMIRI AND ATELES HERPERSVIRUSES. *(E.)* Melendez, L. V. (Harvard Med. Sch. Primate Res. Cent., Boston, Mass.). *Medicina (B Aries)* 34(Suppl. 1):64-65, 1974.

4498 EARLY EVENTS IN TRANSFORMATION OF HUMAN CORD LEUKOCYTES BY EPSTEIN-BARR VIRUS: INDUCTION OF DNA SYNTHESIS, MITOSIS AND THE VIRUS-ASSOCIATED NUCLEAR ANTIGEN SYNTHESIS. *(E.)* Aya, T. (Hokkaido Univ. Sch. Med., Sapporo, Japan) and T. Osato. *Int J Cancer* 14(3):341-347, 1974.

4499 *HERPESVIRUS ATELES*: PROPERTIES OF AN ONCOGENIC HERPESVIRUS ISOLATED FROM CIRCULATING LYMPHOCYTES OF SPIDER MONKEYS (*ATELES* SP.) *(E.)* Falk, L. A. (Dep. Microbiol., Rush-Presbyt.-St. Luke's Univ. Illinois Med. Cent., Chicago), S. M. Nigida, F. Deinhardt, L. G. Wolfe, R. W. Cooper and J. I. Hernandez-Camacho. *Int J Cancer* 14(4):473-482, 1974.

4500 SYNTHESIS OF A DNA BINDING PROTEIN IN NORMAL AND TRANSFORMED CELLS. *(E.)* Rubio, V. (Flow Lab., Inc., Rockville, Md.) and C. Long. *Int J Cancer* 14(3):348-358, 1974.

4501 METHOD FOR ISOLATING MAREK'S DISEASE VIRUS. *(Rus.)* Grinenko, N. F. (Inst. Exp. Clin. Oncol., Moscow, USSR) and Z. I. Merekalova. *Veterinariia* (8):47-48, 1974.

4502 EFFECT OF HERPES SIMPLEX VIRUS UPON NORMAL AND NEOPLASTIC CERVICAL CELL CULTURES. CYTOLOGIC STUDY. *(E.)* Tortora, M. (Dep. Obstet. Gynecol. Univ. Ferrara, Italy). *Cancer Cytol* 14(2):23-25, 1974.

4503 IMMUNOSUPPRESSIVE EFFECT OF FRIEND'S MOUSE LEUKAEMIA AND ANTI-THYMOCYTE SERUM ON HERPES SIMPLEX VIRUS INFECTION IN MICE. *(E.)* Munk, K. (No affiliation) and H. Runnebaum. *Recent Results Cancer Res* 44:45-46, 1974.

4504 SYNTHESIS OF HERPES SIMPLEX VIRUS TYPE 1 (HSV-1) DNA IN ISOLATED NUCLEI. I. CONDITIONS FOR ISOLATION OF NUCLEI CAPABLE OF VIRAL DNA SYNTHESIS. *(E.)* Biswal, N. (Baylor Coll. Med., Houston, Tex.) and B. K. Murray. *Intervirology* 4(1):1-13, 1974.

4505 SYNTHESIS OF HERPES SIMPLEX VIRUS TYPE 1 (HSV-1) DNA IN ISOLATED NUCLEI. II. COVALENT LINKAGE OF RNA TO NASCENT VIRAL DNA. *(E.)* Murray, B. K. (Baylor Coll. Med., Houston, Tex.) and N. Biswal. *Intervirology* 4(1):14-22, 1974.

4506 ASSOCIATION OF HERPES SIMPLEX TYPE 2 VIRUS WITH CERVICAL CANCER OF THE UTERUS. *(E.)* Kao, C. L. (Natl. Taiwan Univ. Hosp., Taipei, Taiwan), Y. H. Chen, M. C. Tang, H. K.Wen and S. Hsia. *J Formosan Med Assoc* 73(2):122-127, 1974.

4507 PHYSICAL PROPERTIES OF THE MOLONEY MURINE LEUKEMIA AND SARCOMA VIRUS RNA. *(E.)* Riggin, C. (Vanderbilt Univ., Nashville, Tenn.), M. Bondurant and W. M. Mitchell. *Fed Proc [II]* 35(5):1604, 1974.

4508 EVIDENCE FOR ASSEMBLY OF DEFECTIVE MURINE LEUKEMIA VIRUS PARTICLES IN ACTINOMYCIN D-TREATED CELLS. *(E.)* Levin, J. G. (Natl. Inst. Health, Bethesda, Md.), P. M. Grimley, J. M. Ramseur and I. K. Berezesky. *Fed Proc [II]* 33(5):1603, 1974.

4509 MECHANISM OF ONCORNA VIRUS-INDUCED HEMOLYTIC ANEMIA. *(E.)* Siegler, R. (Child. Cancer Res. Found., Boston, Mass.), B. Glader, Y. Frosch, I. Lane and A. Talbot. *Fed Proc* 33(3):598, 1974.

4510 INHIBITION OF GROSS MURINE LEUKEMIA VIRUS REPLICATION BY RIFAMYCIN SV AND CERTAIN OF ITS DERIVATIVES *IN VITRO*. *(E.)* Shannon, W. M. (South. Res. Inst., Birmingham, Ala.), L. Westbrook and F. M. Schabel, Jr. *Intervirology* 3(1/2):84-96, 1974.

4511 EFFECT OF THE Fv-1 GENE ON LEUKEMIA VIRUS IN MOUSE CELL HETEROKARYONS. *(E.)* Tennant, R. W. (Biol. Div., Oak Ridge Natl. Lab., Tenn.), F. E. Myer and L. McGrath. *Int J Cancer* 14(4):504-513, 1974.

4512 TRANSPLANTABLE MOUSE LEUKEMIA: DEVELOPMENT OF LEUKEMIA AND VIRUS SYNTHESIS IN THE LIVER OF THE RECIPIENT. *(Ger.)* Fasske, E. (Borstel Res. Inst., Univ. Munster, West Germany), R. Fetting and D. Ruhland. *Verh Dtsch Ges Pathol* 57:414, 1973.

4513 OSTEOSARCOMA INDUCED IN RATS BY MURINE SARCOMA VIRUS (MOLONEY). *(E.)* Kano-Tanaka, K. (Aichi Cancer Cent. Res. Inst., Nagoya, Japan), T. Tanaka and K. Ikemoto. *Proc Jpn Acad* 50(8):641-644, 1974.

4514 VIROLOGIC AND IMMUNOLOGIC PROPERTIES AND RESPONSE TO DAUNOMYCIN AND ADRIAMYCIN OF A NON-REGRESSING MOUSE TUMOR DERIVED FROM MSV-INDUCED SARCOMA. *(E.)* Giuliani, F. (Natl. Inst. Stud. Cure Tumors, Milan, Italy), A. M. Casazza and A. di Marco. *Biomedicine* 21(11):435-439, 1974.

4515 DETECTION OF ONCORNAVIRUS-LIKE PARTICLES IN HUMAN CELL LINES DERIVED FROM TUMOURS OF HEMOPOIETIC TISSUE. *(E.)* Popovic, M. (Cancer Res. Inst., Slovak Acad. Sci., Bratislava, Czechoslovakia), J. Pontén, M. Grófová, K. Nilsson, J. Matoska and A. Bengtsson. *Neoplasma* 21(6):619-627, 1974.

4516 PREVALENCE OF ENDOGENOUS ONCORNAVIRUS IN GUINEA PIGS. *(E.)* Hsiung, G. D. (Yale Univ. Sch. Med., New Haven, Conn.), C. K. Y. Fong and C. H. Evans. *Intervirology* 3(5/6):319-331, 1974.

4517 ANTIVIRAL ANTIBIOTICS: INHIBITION OF FOCUS-FORMATION IN HUMAN OR MOUSE CELL CULTURES BY SARCOMA-INDUCING ONCORNAVIRUSES WITH RIFAMYCINS. *(E.)* O'Connor, T. E. (Natl. Cancer Inst., Bethesda, Md.), P. Schiop-Stansly, V. S. Sethi, A. Hadidi and P. Okano. *Intervirology* 3(1/2):63-83, 1974.

4518 ISOLATION OF PAPOVAVIRUS FROM BRAIN TUMOR AND URINE OF A PATIENT WITH WISKOTT-ALDRICH SYNDROME. *(E.)* Takemoto, K. K. (Natl. Inst. Allergy Infect. Dis., Bethesda, Md.), A. S. Rabson, M. F. Mullarkey, R. M. Blaese, C. F. Garon and D. Nelson. *J Natl Cancer Inst* 53(5):1205-1207, 1974.

4519 SUSCEPTIBILITY OF DIFFERENT AVIAN CELLS TO TRANSFECTION WITH DNA ISOLATED FROM VIROGENIC MAMMALIAN ROUS SARCOMA CELLS. *(E.)* Hlozánek, I. (Inst. Exp. Biol. Genet., Czechoslovak Acad. Sci., Prague) and J. Svoboda. *Folia Biol (Praha)* 20(6):369-377, 1974.

4520 ELECTRON MICROSCOPIC OBSERVATIONS ON THE RIBONUCLEIC ACID MOLECULES OF LINEAR STRUCTURE IN ROUS SARCOMA VIRUS-INDUCED MOUSE ASCITES SARCOMA CELLS. *(E.)* Yamamoto, G. (Cancer Inst. Okayama Univ. Med. Sch., Japan) and T. Oda. *Acta Med Okayama* 28(1):19-26, 1974.

4521 PAPOVAVIRUS STRUCTURAL POLYPEPTIDES: COMPARISON OF HUMAN AND RABBIT PAPILLOMA VIRUSES WITH SIMIAN VIRUS 40. *(E.)* Spira, G. (Baylor Coll. Med., Houston, Tex.), M. K. Estes, G. R. Dreesman, J. S. Butel and W. E. Rawls. *Intervirology* 3(4):220-231, 1974.

4522 HOST RANGE MUTANTS OF POLYOMA VIRUS. *(E.)* Benjamin, T. L. (Public Health Res. Inst. City New York, Inc.) and L. C. Norkin. *Collect Pap Annu Symp Fundam Cancer Res* 25:158-168, 1974.

4523 THYMIDINE KINASE INDUCTION IN MOUSE EMBRYO CELLS BY POLYOMA VIRUS. I. EFFECT OF 5-BROMO-2'-DEOXYURIDINE. *(E.)* Zemla, J. (Inst. Virol., Slovak Acad. Sci., Bratislava, Czechoslovakia). *Acta Virol (Praha)* 18(4):273-283, 1974.

4524 ULTRASTRUCTURE OF THE RIBONUCLEOPROTEIN AND MESSENGER-LIKE RIBONUCLEIC ACID OF THE POLYRIBOSOMES ISOLATED FROM ROUS SARCOMA VIRUS-INDUCED MOUSE ASCITES SARCOMA CELLS. *(E.)* Yamamoto, G. (Okayama Univ. Med. Sch., Japan) and T. Oda. *Acta Med Okayama* 28(3):139-146, 1974.

4525 SYNTHESIS OF RAUSCHER LEUKEMIA VIRUS-SPECIFIC POLYPEPTIDES IN WHOLE CELLS AND CELL-FREE SYSTEMS. *(E.)* Arcement, L. J. (Univ. Texas Syst. Cancer Cent., Houston), R. B. Naso and R. B. Arlinghaus. *Fed Proc [II]* 33(5):1603, 1974.

4526 *IN VITRO* POLYPEPTIDE SYNTHESIS PROGRAMMED WITH RAUSCHER LEUKEMIA VIRUS RNA. *(E.)* Wang, C. S. (Univ. Texas M. D. Anderson Hosp. Tumor Inst. Houston), R. B. Naso and R. B. Arlinghaus. *Collect Pap Annu Symp Fundam Cancer Res* 25:333-361, 1974.

4527 FOLIC ACID METABOLISM IN RAUSCHER MURINE LEUKEMIA AND EFFECT OF METHOTREXATE ON THE BLOOD PICTURE. *(E.)* Taguchi, H. (Okayama Univ. Med. Sch., Japan), H. Sanada, T. Hasei, K. Hara, I. Mizukawa, T. Sezaki, S. Irino, I. Iwasaki and K. Hiraki. *Acta Med Okayama* 28(5):353-359, 1974.

4528 ANTITUMOR ACTIVITY OF NEOCARZINOSTATIN, EFFECT ON RAUSCHER LEUKEMIA IN MICE. *(E.)* Takahashi, I. (Okayama Univ. Med. Sch., Japan), H. Moriwaki, K. Kitajima, S. Irino and K. Hiraki. *Acta Med Okayama* 28(4):271-276, 1974.

4529 RANDOM CHROMOSOME CHANGES FOLLOWING SA7 TRANSFORMATION OF SYRIAN HAMSTER CELLS. *(E.)* Popescu, N. C. (Natl. Cancer Inst., Bethesda, Md.), C. D. Olinici, B. C. Casto and J. A. Dipaolo. *Int J Cancer* 14(4):461-472, 1974.

4530 MAPPING TEMPERATURE-SENSITIVE MUTANTS OF SIMIAN VIRUS 40: RESCUE OF MUTANTS BY FRAGMENTS OF VIRAL DNA. *(E.)* Lai, C. J. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.) and D. Nathans. *Virology* 60(2):466-475, 1974.

4531 A SIMPLE QUALITATIVE SPOT COMPLEMENTATION TEST FOR TEMPERATURE-SENSITIVE MUTANTS OF SV40. *(E.)* Tevethia, M. J. (Tufts Univ. Sch. Med., Boston, Mass.), L. W. Ripper and S. S. Tevethia. *Intervirology* 3(4):245-255, 1974.

4532 DELETION MUTANTS OF SIMIAN VIRUS 40 GENERATED BY ENZYMATIC EXCISION OF DNA SEGMENTS FROM THE VIRAL GENOME. *(E.)* Lai, C. J. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.) and D. Nathans. *J Mol Biol* 89(1):179-193, 1974.

4533 *HEMOPHILUS AEGYPTIUS* RESTRICTION ENDONUCLEASE CLEAVAGE MAP OF THE SIMIAN VIRUS 40 GENOME AND ITS COLINEAR RELATION WITH THE *HEMOPHILUS INFLUENZAE* CLEAVAGE MAP OF SV40. *(E.)* Lebowitz, P. (Yale Univ. Sch. Med., New Haven, Conn.), W. Siegel and J. Sklar. *J Mol Biol* 88(1):105-123, 1974.

4534 SURFACE ANTIGENS ASSOCIATED WITH TRANSFORMATION OF 3T3 CELLS BY SIMIAN VIRUS 40 ASSAYED BY ISOELECTRIC EQUILIBRIUM METHOD. *(E.)* Sherbet, G. V. (Univ. Coll. Hosp. Med. Sch., London, England), M. S. Lakshmi and H. B. Coakham. *J Int Res Commun* 2(8):1485, 1974.

4535 LOCATION AND NUCLEOTIDE SEQUENCE OF THE SITE ON SV40 DNA METHYLATED BY THE *ECO* B MODIFICATION METHYLASE. *(E.)* Dugaiczyk, A. (Dep. Biochem. Biophys., Univ. California, San Francisco), M. Kimball, S. Linn and H. M. Goodman. *Biochem Biophys Res Commun* 61(4):1133-1140, 1974.

4536 FLOW MICROFLUOROMETRY ANALYSIS OF DNA CONTENT IN CHINESE HAMSTER CELLS FOLLOWING INFECTION WITH SIMIAN VIRUS 40. *(E.)* Horan, P. K. (Biophys. Instrum. Group, Los Alamos Sci. Lab., N.M.), J. H. Jett, A. Romero and J. M. Lehman. *Int J Cancer* 14(4):514-521, 1974.

4537 ALTERATION OF PROTEIN COMPONENTS OF TRANSFORMED CELL MEMBRANES IN TWO VIRUS-CELL SYSTEMS. *(E.)* Burge, B. W. (Dep. Biol., Massachusetts Inst. Technol., Cambridge), H. Sakiyama and G. Wickus. In: *Developmental Aspects of Carcinogenesis and Immunity* edited by T. J. King. New York, Academic Press, Inc., 1974, pp. 105-121.

4538 EFFECT OF TEMPERATURE ON PRODUCTION OF VIRUS BY SHOPE'S FIBROMA. *(Fr.)* Grange, J. (Virol. Unit., INSERM, Lyon, France). *C R Acad Sci* [*D*] *(Paris)* 279:1515-1518, 1974.

See also:

* (Rev): 4211, 4212, 4213, 4214, 4215, 4216, 4217, 4218, 4219, 4220, 4242, 4243
* (Chem): 4288
* (Immun): 4544, 4546, 4547, 4548, 4550, 4551, 4553, 4566, 4567, 4572, 4583, 4584, 4596, 4597, 4598, 4599, 4600, 4601, 4603, 4617, 4622, 4624, 4626, 4631, 4637, 4640
* (Path): 4654, 4705
* (Epid-Biom): 4719

4539 MANIFESTATIONS OF IMMUNOMORPHOLOGICAL REORGANIZATION IN CYSTIC-GLANDULAR HYPERPLASIA OF THE ENDOMETRIUM. *(Rus.)*

Ermakova, F. B. (I. P. Pavlov 1st Leningrad Med. Inst., USSR). *Arkh Patol* 35(9):41-45, 1972.

The lymph nodes, spleen, bone marrow, and liver were examined in 40 adult female golden hamsters with cystic-glandular hyperplasia of the endometrium induced by diethylstilbestrol dipropionate (0.1 mg/100 g/day) for five to 200 days; ten untreated hamsters served as controls. Myeloid metaplasia of the spleen and hyperplasia of the bone marrow developed soon after initiation of treatment. After 60 to 90 days, the degree of hyperplasia suddenly decreased. This might be due to slight stimulation of ACTH in the adrenals and the related low level of glucocorticoids in the blood which are characteristic of hamsters and to increased hyperestrogenism. The latter is morphologically manifested by keratinization of the vaginal epithelium which occurs after 60 days of treatment. Hyperestrogenism produced a nonspecific reaction in the reticuloendothelial system, as evidenced by plasma cell transformation; increases in the RNA content of large and small reticular cells and plasmoblasts; and increased hemosiderosis. The number of plasma cells in the lymph nodes initially increased but was significantly decreased after 200 days. This was accompanied by the appearance of plasma cells in the lumina of capillaries. It is suggested that these plasma cells were washed out of the lymph nodes. These findings indicate that even localized specific changes which occur in target organs in sexual steroid imbalances are accompanied by mobilization of all immunocompetent organs and indirect participation of cellular immunogenesis in the normalization of steroid homeostasis.

4540 TESTS ON HORMONE-DEPENDENCE AND IMMUNITY IN MASTOPATHY AND BREAST CARCINOMA. *(E.)*

Till, G. (Tech. Univ. Budapest, Hungary), J. Gyarmati and F. Masszi. *Proc. Fifth Int. Symp. Biol. Characterization Hum. Tumors, Bologna, April 4-6, 1973* pp. 191-196, 1974.

Tests for hormone-dependence and for immune-dependence on fibrocystic mastopathy and breast carcinoma were performed in 77 patients with mastopathy and 73 patients with breast carcinoma. 17-Ketosteroid and its fractions were assayed in 24 hr urine and compared with normal values by age groups. In mastopathy, excretion of 17-ketosteroid, dehydroepiandrosterone, and androsterone is less than normal; in breast carcinoma, it is not reduced. In breast carcinoma etiocholanolone was more often raised than in mastopathy. In normal women over 40, etiocholanolone is reduced to half; this did not occur in 23 out of 73 breast carcinoma patients. In five breast carcinoma patients androgen secretion was reduced after ovariectomy. Immunograms and lymphoblast transformation tests were done in 16 patients. In mastopathy, humoral immunity was near normal and cellular immunity was lower than or near to normal. In breast carcinoma, the results of both these tests were widely scattered both above and below normal.

4541 STUDIES ON CELL-MEDIATED REACTIONS AGAINST CULTURED BURKITT LYMPHOMA CELLS. *(E.)*

Golub, S. H. (Dep. Tumor Biol., Karolinska Inst., Stockholm, Sweden), J. F. Hewetson, E. A. J. Svedmyr, G. Klein and S. Singh. *Bibl Hematol* (39):818-827, 1973.

Leukocytes from patients with Burkitt's lymphoma and nasopharyngeal carcinoma were tested for activity in a colony inhibition assay against Burkitt tumor-derived lymphoblastoid culture lines. No significant inhibitory activity could be detected. The assay method used readily detected non-specifically stimulated (phytohemagglutinin) effector cells or specific cytotoxic cells obtained from mixed leukocyte cultures. Leukocytes from patients with Burkitt's lymphoma could be stimulated with mitomycin C-treated autochthonous culture line cells and showed strong activity in the colony inhibition assay when tested against autochthonous or allogeneic Burkitt lines. These results suggest that there are tumor-associated antigens in Burkitt's lymphoma-derived culture lines that can sensitize leukocytes and result in a cytotoxic reaction.

4542 TUMOR FACILITATION IN A SYNGENEIC HOST-TUMOR SYSTEM. *(E.)*

Cohen, J. M. (Natl. Cancer Inst., Bethesda, Md.) and L. W. Law. *Proc Soc Exp Biol Med* 147(3):744-748, 1974.

Active tumor facilitation in a syngeneic system using a polyoma-induced immunogenic cell line (Py-8941b) to facilitate growth of the oncogenic cell line was investigated and the kinetics of active tumor facilitation determined and correlated with the development of cell-mediated immunity. Ten-week old female C57B/KaLw mice were divided into six groups: one group received no immunization; four groups received one i.p. injection of 2 x 10^7 Py-8941b cells at one, two (II), three (III), and four (IV) weeks prior to challenge *in vivo* and testing *in vitro*; and one group received six weekly i.p. injections of 2 x 10^6 Py-8941b cells with the last immunization occurring one week prior to challenge (MI). Mice from each of the six groups were challenged s.c. with 10^5, 10^6, or 10^7 partially oncogenic Py-8941b cells and were followed for 20 weeks. Mice developed progressively growing tumors at the following rates: non-immunized, 24%; challenged one week postimmunization, 46%; challenged two weeks postimmunization, 62%; challenged three weeks postimmunization 78%; and challenged four weeks after immunization, essentially the same as non-immunized mice. Cell-mediated immunity as measured by the ^{51}Cr release cytotoxicity assay was first noted one week after immunization, became undetectable by 14 days postimmunization, and could not be detected in groups II, III, IV, and MI. In the microcytotoxicity assay, cell-mediated immunity did not become detectable until 12 days postimmunization, but once detectable it remained so for the 35-day test period. Groups II, III, IV, and MI displayed cell-mediated immunity using this technique. There appeared to be an inverse relationship between the two assays for cell-mediated immunity. Further investigations indicated that the kinetic differences between the two assays are not the result of differences in attacking cell populations. Tumor facilitation appears to be a nonstatic phenomenon depending largely on when mice are challenged in relation to their last immunization with no apparent relationship to the *in vitro* development of cell-mediated immunity.

4543 INTRA-EPITHELIAL CARCINOMA OF THE VAGINA FOLLOWING IMMUNOSUPPRESSION TREATED WITH TOPICAL 5-FLUOROURACIL.

(E.) Bowen-Simpkins, P. (Samaritan Hosp. Women, London, England) and M. G. R. Hull. *Proc R Soc Med* 67(7):589-590, 1974.

A 27-yr-old woman was investigated for primary infertility and found to have malignant cells in a cervical smear. Histology of a cervical cone biopsy revealed intra-epithelial squamous carcinoma with widespread glandular involvement. A vaginal biopsy showed similar intra-epithelial carcinoma with surface differentiation. Bilateral nephrectomy and renal allograft had been performed 6 years previously for chronic pyelonephritis. The patient had been on immunosuppressive therapy from that time and at referral was taking 150 mg azathioprine and 15 mg prednisolone/day. The vaginal lesions were treated with 5% 5-fluorouracil cream for two weeks. Subsequently, most of the upper half of the vagina was temporarily denuded of epithelium and was lined by granulation tissue, being thus clearly demarcated from the apparently healthy lower vagina. Cytology and biopsies of both halves showed no evidence of malignancy. After eight months, coitus was normal, the vagina appeared healthy, and cytology was negative. 5-Fluorouracil appears to have a useful place in the treatment of intra-epithelial carcinoma of the vagina. This case underlies the need for regular cytological examination of the cervix and vagina in all patients receiving long-term immunosuppressive therapy.

4544 PROTECTIVE EFFECT OF IMMUNIZATION WITH POLYINOSINIC·POLYCYTIDYLIC ACID COMPLEXED WITH METHYLATED BOVINE SERUM ALBUMIN AGAINST FRIEND LEUKEMIA VIRUS IN MICE.

(E.) Fourcade, A. (Dep. Immunol., Inst. Gustave-Roussy, Villejuif, France), C. Friend, F. Lacour and J. G. Holland. *Cancer Res* 34(7):1749-1751, 1974.

DBA/2J mice were innoculated i.p. with a mixture of poly(I)·poly(C) (40 µg) and methylated bovine serum albumin (MBSA, 40 µg) once weekly for four weeks. One week later, they were injected i.v. with the mixture, and this was repeated three weeks afterward. One week after the final immunization, the antibody content of the serum was analyzed and the mice were challenged by i.p. inoculation of a filtrate of Friend leukemia virus (FLV). Analysis of the serum of the immunized mice revealed antibodies reacting specifically against the polynucleotide structure. Each of the antisera bound similarly to the immunogen poly(I)·poly(C) as well as to another polynucleotide complex, poly(A)·poly(U). In addition, on challenge with FLV, a sparing effect in the immunized mice was evident and there was approximately a 1.5-log difference in infectivity. The survivors remained free of disease for six months. The results indicate that the polynucleotide complexes may provide a promising means of immunizing against the oncornaviruses.

4545 ISOLATION OF TUMOR LOCALIZING ANTIBODIES BY IMMUNOSORBENTS. III. ISOLATION OF HETEROLOGOUS ANTIBODIES FOR HUMAN CERVICAL CARCINOMA AND RENAL CARCINOMA.

(Ger.) Teichmann, B. (Cent. Inst. Cancer Res., Berlin-Buch, Germany) and R. Vogt. *Arch Geschwulstforsch* 43(2):145-156, 1974.

Rabbits were immunized with extracts obtained from pooled human cervical carcinoma tissue and a human renal carcinoma in an attempt to isolate heterologous antibodies for these carcinomas. Immunoglobulins in the antisera were concentrated by the ammonium sulfate precipitation technique. In the case of anti-cervical carcinoma serum, the immunoglobulin preparation reacted with serum proteins, extract of cervical squamous cell epithelium and cervical carcinoma extract. In the case of anti-renal carcinoma serum, the corresponding immunoglobulin preparation reacted with serum proteins, kidney extract, and renal carcinoma extract. The immunoglobulin preparations were reacted step-by-step with immunosorbents which had the specificities of human serum proteins, cervical squamous cell epithelium and kidney, resp., to eliminate all antibodies directed against the normal tissue components and serum proteins. The immunosorbents employed had, as a base, cellulose-*m*-aminobenzoxymethyl ether containing one group which could be diazotized per 47 glucose units of the cellulose derivative. As demonstrated by Ouchterlony tests and immunoelectrophoresis, antibodies that reacted with normal tissue extracts could be removed from the immunoglobulin preparations by one-step absorption. In further immunosorption, the antitumor antibodies were fixed to the corresponding immunosorbents, after which they were detached and eluted. The resulting antibody preparations were identified as pure γ-globulins. These antibody preparations reacted only with the extracts from cervical carcinoma and renal carcinoma, resp., but not with extracts from normal tissues of other organs, e.g., heart, lung, liver and spleen. Injection of ^{131}I-labeled renal carcinoma antibodies i.v. made possible the scintigraphic detection of lymph node metastases following removal of a renal carcinoma in a female patient.

4546 ANTIBODIES UNRELATED TO EPSTEIN-BARR VIRUS IN HUMAN SERA WHICH PRECIPITATE SOLUBLE COMPONENTS OF CULTURED LYMPHOBLASTS.

(E.) Guerra, A. (Div. Virol., Child. Hosp., Philadelphia, Pa.), U. Koldivsky and W. Henle. *J Natl Cancer Inst* 53(5):1193-1200, 1974.

In immunodiffusion tests with extracts of cultured human lymphoblasts and human sera, several lines of precipitation were obtained, including two that were clearly unrelated to the Epstein-Barr virus (EBV). All 96 human sera without antibodies to EBV produced at least one line, and many produced both lines, as did sera from several animals of different species (rabbits, mice, guinea pigs, and horses). The corresponding antigens were present not only in lymphoblasts harboring Epstein-Barr viral DNA but also in astoid cells which were free of EBV genomes and in tracts of human peripheral and cord-blood leuko- tes. The serum activity was found among the α- obulins and concentrated in the IgG fraction. Al- ough the antigens remained unidentified, they were idently unrelated to the fetal calf serum present the culture media. The development of the pre- pitates was enhanced by incorporation of dextran to the agarose. Sera with high titers of antibodies EBV-related antigens (taken from patients with rkitt's Lymphoma, nasopharyngeal carcinoma, and dgkin's disease) generally gave heavier lines of ecipitation and could be used in higher dilutions an sera without such antibodies, and they produced e or two additional, presumably EBV-specific, lines f precipitation. The results indicate that immuno- iffusion precipitates observed with concentrated BV suspensions are not necessarily due to antibodies Epstein-Barr viral capsid antigens.

547 EBV ANTIBODY IN MONKEYS AND APES. *(E.)*

Kalter, S. S. (Div. Microbiol. Infect. Dis., outhwest Found. Res. Educ., San Antonio, Texas), R. . Heberling and J. J. Ratner. *Bibl Haematol* (39): 71-875, 1973.

epresentative New and Old World monkey and ape sera gorilla, chimpanzee, baboon, marmoset, rhesus and owler monkeys) were examined by indirect immunofluor- scence for the presence of Epstein-Barr virus anti- ody. Antibody was detected only in Old World mon- eys and apes. None of the New World monkeys were ound with this antibody. Gorilla and chimpanzee era were almost always positive with relatively high iters: about 50% of the Old World monkey sera were ound to have the antibody. It is suggested that the ositive results demonstrate a possible phylogenetic elationship to man as regards infection with this irus, since both ape species examined had almost 00% prevalence of positive reactions, whereas the ld World monkeys had less than 50% positives and hese were generally of lower titer than that seen ith the apes.

548 ESTIMATION OF SPECIFIC ANTIBODY TO TYPE 2 HERPES SIMPLEX VIRUS AMONG PATIENTS WITH ARCINOMA OF THE UTERINE CERVIX. *(E.)*

Kawana, T. (Univ. Tokyo Sch. Med., Japan), K. Yoshino and T. asamatsu. *Gann* 65(5):439-445, 1974.

The neutralization kinetic curve experiment used for the estimation of antibodies to herpes simplex virus type 1 (HSV-1) and type 2 (HSV-2) in human sera was standardized. Basic tests using sera of rabbits immunized with HF (HSV-1) and with UW-268 (HSV-2) strains indicated that the K value against HSV-2 minus two-tenths of that against HSV-1 could express the level of specific anti-HSV-2 neutralizing antibody, and that if the resulting value were higher that 0.25 it could be regarded as being significantly positive. Based on this criterion, 75 patients with uterine cervical carcinoma and 105 age-matched controls were examined for anti-HSV-2 antibody. In both the cancer and control groups, the positive rate as well as the mean titer of this antibody increased with age, but this increase seemed to start at a relatively younger age in the cancer group. The difference between the two groups was small; among women younger than 50 years, the positive rates in the cancer and control groups were 63-77% and 52-58%, resp., while no differences could be observed among the older women. Among the cancer patients, specific anti-HSV-2 antibody was seen more frequently in those whose cancer was in the advanced clinical stages. The relationship between HSV-2 and cervical cancer remains unclear.

4549 IMMUNOGLOBULINS ON THE SURFACE OF BLAST CELLS IN PATIENTS WITH ACUTE LEUKEMIA.

(Rus.) Samoilova, R. S. (Cent. Inst. Hematol. Blood Transfus., Moscow, USSR), T. I. Bulychev and S. V. Skurkovich. *Probl Gematol Pereliv Krovi* 19(10):33-37, 1974.

Immunofluorescence studies were conducted on the immunoglobulin (Ig) present on the surfaces of myeloid cells to determine the type of lymphocytes affected in lymphatic leukemia. Leukocytes from 24 healthy donors and blast cells from 108 patients with acute leukemia were isolated from heparinized blood incubated at 37 C for 30-60 min. In acute lymphoblastic leukemia, no Ig was present on the surfaces of blast cells in the peripheral blood, which is indicative of proliferation of T-cells in the lymphoid system. During complete remission, the B-/T-lymphocyte ratio was similar to that of healthy humans. In acute myeloblastic leukemia, the majority of patients had Ig blast cells (13 of 16 children and 23 of 37 adults). Approximately one-third of the adults and some children revealed Ig-positive blast cells prior to chemotherapy (unspecified). It is suggested that the presence of Ig on the surface of blast cells may indicate acute myelomonocytic leukemia. One child had a practically identical level of Ig-positive cells (31%) and monocytoid cells in the blood, with the lymphocyte level at 6%.

4550 STUDIES ON THE NATURE OF THE ABNORMALITY OF B CELL DIFFERENTIATION IN AVIAN LYMPHOID LEUKOSIS: PRODUCTION OF HETEROGENEOUS IgM BY TUMOR CELLS. *(E.)*

Cooper, M. D. (Dep. Pediatr., Univ. Alabama, Birmingham), H. G. Purchase, D. E. Bockman and W. E. Gathings. *J Immunol* 113(4):1210-1222, 1974.

Immunoglobulin (Ig) production and distribution tumor cell morphology, and virus distribution were examined in chickens with lymphoid leukosis induced the A subgroup of leukosis/sarcoma viruses. Regardless of their location, virtually all lymphoma cells had detectable surface IgM; the prevalent distribution pattern produced by the bivalent fluorescein-labeled antibodies to IgM determinants was one of global patching. The tumor cells contained variable amounts of cytoplasmic IgM. Birds with widespread lymphomatous involvement of visceral organs had high serum IgM levels, indicating release of IgM from tumor cells. Both high- and low-molecular wt IgM were present in serum from birds with disseminated lymphomas, and both forms were electrophoretically heterogenous. Lymphomatous birds had elevated titers of agglutinating antibodies to sheep and human RBC but had normal levels of antibodies to *Salmonella typhi* flagellar antigens and leukosis virus neutralizing antibodies. None of the tumor cells expressed IgG or IgA; IgG levels were normal in tumor-bearing birds, but IgA levels were usually elevated. Multiple bursal follicles were involved by the tumor process. Tumor nodules in the bursa and in other organs differed in size, cytoplasmic RNA content, and amount of cytoplasmic IgM that were characteristic of their constituent cells. Electron microscopy showed that tumor cells contained an abundance of cytoplasmic ribosomes in clusters and scattered strands of rough endoplasmic reticulum. Most tumor cells appeared not to achieve normal maturation; mature plasma cells were sparsely distributed around tumor nodules. Cell-associated viruses were more abundant in non-tumour cell types than in tumor cells. These results suggest that avian leukosis viruses exert their lymphomagenic effect by interrupting the switch from IgM to IgG gene expression that normally occurs within clones of bursal lymphocytes.

4551 ISOLATION OF 7S-IMMUNOGLOBULINS FROM MURINE SPLEEN CELLS AND SERA DURING THE EARLY STAGES OF RAUSCHER LEUKEMIA. *(Rus.)* Ter-Grigorov, V. S. (Inst. Stand. Qual. Control Biomed. Prep., Moscow, USSR), S. G. Dzagurov, N. A. Dorfman and B. I. Shevelev. *Biull Eksp Biol Med* 77(11):82-85, 1974.

Studies were conducted of the possibility of isolating IgG with antibody properties from the spleen cells of mice with leukemia by elution at low pH, and also from the sera of animals injected with Rauscher virus and complete Freund's adjuvant (CFA). CFA was injected i.p. in C57BL/6 mice followed 6 hr later by i.v. injection of 0.2 ml plasma from BALB/c leukemic mice. The data obtained from the indirect cytotoxic test and the indirect immunofluorescence reaction indicate that the isolated IgG is capable of a specific reaction with leukemic cell membranes. The use of 1%-glutaraldehyde-immobilized leukemic cells as immunosorbents made it possible to isolate IgG from 7S-fraction serum, which also possessed antibody properties against the membrane antigens of leukemia cells.

4552 PHYTOHEMAGGLUTININ-INDUCED BLASTOID TRANSFORMATION OF LYMPHOCYTES, SKIN TESTS AND IMMUNOGLOBULIN LEVELS IN CLINICALLY ADVANCED MALIGNANT LYMPHOGRANULOMATOSIS. *(E.)* Traczyk, Z. (Hematol. Clin., Inst. Hematol., Warsaw, Poland), S. Ciesluk and J. Litwin. *Arch Immunol Ther Exp* 22(5):595-600, 1974.

Thirty-four patients with advanced malignant lymphogranulomatosis (26 in the fourth stage, seven in the third stage, and one in the second stage of the disease) were studied to determine the relationship between their clinical status and their skin tests to various antigens, the ability of their lymphocytes to undergo blastoid formation (BTL) *in vitro*, and the production of immunoglobulins (Ig) by their B lymphocytes. In comparison with healthy controls, the mean phytohemagglutinin (PHA)-induced BLT values were decreased by 50% and the serum IgG levels were significantly elevated in the malignant lymphogranulomatosis patients. The IgM levels were low in 11 patients and elevated in six patients. The tuberculin skin tests were negative in all patients and the tests with streptolysin and dinitrochlorobenzene were positive in only a few cases. Among the lymphogranulomatosis patients, there were four cases of hypergammaglobulinemia, ten cases of elevated IgA levels, four cases of elevated levels of two Ig classes, and four cases of decreased levels of all three Ig classes. The values of BTL, IgG, IgA, and IgM were slightly lower in patients in severe condition than in those in good condition. There was no significant association between BTL values and IgM levels. The results indicate that BTL and Ig cannot serve as prognostic indices in malignant lymphogranulomatosis.

4553 DISTRIBUTION OF SURFACE CHARGE AND CONCANAVALIN A-BINDING SITES ON NORMAL AND MALIGNANT TRANSFORMED CELLS. *(E.)* Marikovsky, Y. (Weizmann Inst. Sci., Rehovot, Israel), M. Inbar, D. Danon and L. Sachs. *Exp Cell Res* 89(2):359-367, 1974.

Differences in the amount and distribution of negative surface charge on normal and malignant transformed cells and the electron microscope distribution of Concanavallin A (Con A) sites on these cells were studied. The cells used included normal fibroblasts from secondary cultures of golden hamster embryos, Simian virus 40-transformed fibroblasts from hamster tumor, normal lymphocytes from adult rat lymph nodes, and lymphoma cells from an ascites form of a Moloney virus-induced lymphoma in A strain mice. Normal cells agglutinated faster than the transformed cells as measured with poly-L-lysine (pLys). Treatment with neuraminidase (50-100 U, 37 C, 60 min) decreased the rate of agglutination in both types of cells, which correlated with the labeling density of surface negative charges. Untreated lymphoma cells were irregularly labeled; after treatment with neuraminidase there was practically no labeling, while normal lymphocytes showed a significant reduction of labeling after treatment. Prefixation of cells with glutaraldehyde caused a random distribution of cationized ferritin in normal and transformed cells. Transformed cells agglutinated at a high rate with 500 μg/ml Con A, while normal cells did not agglutinate. Neuraminidase increased the agglutinability of both cell types and both types bound similar amounts of labeled Con A (^{3}H-acetic anhydride), indicating that the reduction in surface negative charge was not associated with changes in the number of specific binding sites for Con A. All cells labeled with 50 μg/ml Con A-ferritin showed an even distribution pattern. The results indicate a difference in the redistribution of surface charge by cationized ferritin in normal and transformed cells, but no detectable difference in redistribution of Con A-binding sites with Con A-ferritin.

4554 LOCALIZATION OF α-FETOPROTEIN BY IMMUNOFLUORESCENCE IN HYPERPLASTIC NODULES DURING HEPATOCARCINOGENESIS INDUCED BY 2-ACETYLAMINOFLUORENE. *(E.)* Okita, K. (Fels Res. Inst., Philadelphia, Pa.), M. Gruenstein, M. Klaiber and E. Farber. *Cancer Res* 34(10):2758-2763, 1974.

method has been developed for the localization of fetoprotein (α_1F) in rat tissue by immunofluores- nce. Male Wistar rats were maintained for 25 weeks a basal diet containing 0.05% 2-acetylaminofluor- e (2-AAF). The serum was analyzed weekly for α_1F, d the immunofluorescent technique was used to study e localization of α_1F in the liver. The gross α_1F vels in the serum of the carcinogen-treated rats owed early and late peaks similar to those found eviously. Seemingly specific localization of α_1F the liver was seen regularly by immunofluores- nce using rabbit anti-rat α_1F. Positive staining s seen in fetal rat liver, meconium in the fetal t intestinal tract, and hepatomas from rats show- high serum α_1F levels. Normal rat liver and the ivers of α-naphthyl isothiocyanate-treated rats showed egative staining. Positively staining tissues also owed negative staining after blocking tests using reimmune rabbit serum and rabbit anti-α_1F serum ab- orbed with isolated rat α_1F before staining. Spec- fic fluorescence was seen in the hepatocytes of many yperplastic nodules. Virtually all the hepatocytes n any single nodule were uniformly stained or un- tained; the nuclei were uniformly unstained. The rightness of α_1F positive cells in the hyperplastic odules was uniformly weaker than that in positively tained hepatomas and fetal livers. There were no bvious histological or cytological differences be- ween the positively and negatively stained hepato- ytes. Control animals showed no positive fluores- ence for α_1F in their livers. The data suggest that he hepatocyte population in the hyperplastic nodules s at least one precursor for the ultimate development f hepatocellular carcinoma and indicate the probable lonal nature of the nodules.

4555 ANTIGENETIC ANALYSIS OF TRANSFORMED AND NONTRANSFORMED CELLS FROM HUMAN NEOPLASMS.

E.) Maruyama, K. (Dep. Virol., Univ. Tex., Houston) nd L. Dmochowski. *Prog Exp Tumor Res* 19:253-269, 1974.

Antisera to feline leukemia virus (FeLV), murine leukemia virus (MuLV) or Epstein-Barr (EB) virus were tested against human cell cultures and two animal cell cultures by mixed hemadsorption (MHA) and fixed immunofluorescence (FIF) in an attempt to analyze antigens in the cytoplasm and on the surface of these cells. Twenty-one cell cultures derived from human malignant and nonmalignant tissues, one feline and one murine line (five of these were transformed) were tested with goat antifeline (Theilen) virus serum, goat antimurine (Moloney) leukemia virus serum, The National Cancer Institute rabbit anti-EB virus serum and goat antifeline (Rickard) leukemia virus serum. In the MHA test the unabsorbed leukemia virus antisera reacted only with the transformed cell cultures. Goat antimurine leukemia serum gave the highest titers. In the FIF test the same sera reacted with most nontransformed cell cultures (low titers) and with all transformed cell cultures (higher titers). In both tests inoculation of the nontransformed cell cultures with bone marrow aspirates from leukemia patients did not result in a reaction with the antisera. Specificity of the FIF test was examined by absorption of the sera with blood cells and guinea pig kidney homogenates. Some of the titers were reduced by a factor of four to eight. Titers of the absorbed sera against virus producing cultures, though reduced, were significantly higher than those against cultures not producing virus particles. Absorption of the sera with BT cells completely eliminated the reaction of all cell cultures with goat antifeline (Theilen) leukemia virus serum, and reduced the titers of the reaction of goat antimurine leukemia virus serum against virus producing cells. In the MHA test the reaction of transformed cell cultures to goat antifeline (Theilen) leukemia virus serum and goat antimurine leukemia virus serum (both absorbed with BT and FeLV) was eliminated or the titers were greatly reduced. Anti-EB virus serum reacted in the FIF test with the transformed human cells only if absorbed with sheep red blood cells and guinea pig kidney homogenates, not with the feline and murine cells. In the MHA test it reacted with the human transformed cells and the feline cells, but not with the murine cells, when absorbed with different viruses. Sera from 20 patients with various malignancies and from five normal individuals were tested against transformed human cells. They were negative in the MHA test and positive in the FIF test only at a dilution of 1:4. It has been demonstrated that human cells, when transformed, show in the cytoplasm and on the surface antigens reactive with the sera tested. It is suggested that the relationship between the antigenic conversion of human cells during transformation and the RNA tumor virus genome requires further investigation.

4556 IMMUNOELECTRONMICROSCOPIC ANALYSIS OF SURFACE ANTIGENS COMMON TO *MYCOBACTERIUM BOVIS* (BCG) AND TUMOR CELLS.

(E.) Bucana, C. (Biol. Div., Oak Ridge Natl. Lab., Tenn.) and M. G. Hanna, Jr. *J Natl Cancer Inst* 53(5):1313-1323, 1974.

The presence of cell-surface antigens on guinea pig line-10 hepatocarcinoma cells was investigated by immunoelectronmicroscopy with the use of xenogeneic and syngeneic tumor-specific antibody and syngeneic *Mycobacterium bovis*-induced antibody. In addition to tumor-specific antigen(s) there were common antigens between line-10 hepatocarcinoma cells and *Mycobacterium bovis* organisms. The specificity of this cross-reactivity was supported by blocking experiments and absorption of the specific antibody to *Mycobacterium bovis* organisms, with subsequent immunoelectronmicroscopy of the *Mycobacterium bovis* and loss of reactivity to tumor cells. Complement-dependent serum cytotoxicity was correlated with the immunoelectronmicroscopic assay. Cross-reactivity of the *Mycobacterium bovis*-specific antibody with the surface of cells of a human melanoma culture grown from an excised s.c. melanoma was also demonstrated by immunoelectronmicroscopy. It is concluded that these results verify the presence of common antigens between *Mycobacterium bovis* organisms, line-10 hepatocarcinoma cells of strain-2 guinea pigs, and an early human melanoma cell culture.

4557 ENHANCEMENT OF DELAYED SKIN HYPERSENSITIVITY BY NEURAMINIDASE IN CANCER PATIENTS.

(E.) Han, T. (Roswell Park Mem. Inst., Buffalo, N.Y.). *Clin Exp Immunol* 18(1):95-100, 1974.

Delayed skin hypersensitivity to various antigens (0.2 ml, intradermally) with and without *Vibrio cholerae* neuraminidase (VCN, 5 U) was studied in 18 patients with Hodgkin's disease, 12 with lymphosarcoma, 5 with reticulum cell sarcoma, 3 with chronic lymphocytic leukemia, and 1 each with polycythemia vera, myelofibrosis with myeloid metaplasia, and bronchogenic carcinoma. VCN enhanced delayed skin hypersensitivity to purified protein derivative (PPD), Varidase, Keyhole limpet hemocyanin (KLH), mumps, or monilia in 20 of 28 patients with positive skin-test response. The PPD or Varidase skin test with VCN was positive in 5 of 14 patients in whom the respective test without VCN was negative; these patients may have been actually sensitive subjects with prior contact with these antigens. No VCN enhancement of KLH, mumps, or monila skin test was observed in 6 patients with initially negative skin test response. Heating VCN for 10 min at 100 C abolished its enhancing effect on delayed skin hypersensitivity. No reaction at the site of VCN was noted in any case, indicating that the enhancement effect is immunological in nature.

4558 MODULATION OF THE IMMUNE RESPONSE TO TRANSPLANTATION ANTIGENS. II. THE EFFECTS OF HETEROLOGOUS ANTISERA ON THE GROWTH OF TUMOUR ALLOGRAFTS IN MICE. *(E.)* Zola, H. (Biol. Div., Wellcome Res. Labs., Kent, England). *Clin Exp Immunol* 16(3): 461-467, 1974.

Radiation-induced leukemia cells isolated from CBA mice were injected i.p. into CBA, BALB/c, and C57/Bl mice. A dose of 10^6 tumor cells led to progressive tumor growth and death in the CBA mice, while the other two strains rejected the cells without much swelling. A dose of 10^7 tumor cells led to considerable swelling in the BALB/c and C57/Bl mice, but most animals rejected the tumor within 25 days. Treatment of the tumor cells with rabbit antimouse lymphocyte sera (RAMLS) enhanced tumor growth following injection of the cells into BALB/c mice. Enhanced tumor growth was not observed when mice were injected with tumor cells which had been incubated with RAMLS and washed twice in PBS prior to injection, or when they were injected with tumor cells which had been treated with a pepsin digest of RAMLS. RAMLS had no effect on the growth of the BP8 sarcoma. RAMLS was administered s.c., i.p., or i.v. to BALB/c mice 24 hr before challenge with radiation-induced cells. Tumor enhancement was slightly greater with s.c. than i.p. injection, and considerably reduced with i.v. injection. Rabbit antisera raised against radiation-induced cell membranes gave no tumor enhancement. Injection of rabbit antisera against BP8 cell membrane enhanced tumor growth. Pretreating the tumor cells *in vitro* with antiserum delayed the onset of the cellular immune response in BALB/c mice injected with the treated cells. These results suggest that the *in vivo* effects of antilymphocytic sera are largely the result of a normal antilymphocytic action.

4559 A TUMOUR-ASSOCIATED MEMBRANE ANTIGEN TRANSIENTLY EXPRESSED BY NORMAL CELLS DURING MITOSIS. *(E.)* Bertini, M. (Univ. Torino, Med. Sch., Italy), G. Forni and P. M. Comoglio. *Clin Exp Immunol* 18(1):101-108, 1974.

Antisera against solubilized membrane antigens (ADK-SMA) of a transplantable BALB/c mammary adenocarcinoma (ADK-1t) were raised in New Zealand male rabbits. The antisera precipitated an antigen (ADK) that was not expressed by normal BALB/c mammary gland or any other normal mouse tissue (liver, kidney, lung, heart, brain, thymus, spleen). The antisera did react with other spontaneous primary breast adenocarcinomas although not with tumors of different histologic types (plasmacytoma, sarcoma, neuroblastoma). The antigen was transiently expressed by mammary gland cells during the hyperplasia that both precedes and accompanies lactation. ADK-antigen is particulate and is contained in the 100,000 g sedimented cell fraction; its absence from free ribosomes suggests that it is probably a constituent of membranes themselves rather than of membrane-bound ribosomes. The close connection between antigen expression and cell proliferative activity supports the supposition that changes in antigen composition may result from membrane structural changes occurring during mitosis.

4560 DIFFERENCES IN THE EXPRESSION OF A CELL SURFACE ANTIGEN AMONG VARIOUS MURINE MYELOMA TUMOR CELLS. *(E.)* Laskov, R. (Hebrew Univ.-Hadassah Med. Sch., Jerusalem, Israel), R. Rabinowitz and M. Schlesinger. *Isr J Med Sci* 10(8):847-855, 1974.

The relationship of the presence or absence of the surface antigen Bl to neoplastic transformation was studied in several lines of murine myeloma cells. Rabbit antiserum against BALB/c thymus absorbed with brain and MPC-11 myeloma cells (RAT-1) was highly cytotoxic to normal cells of thymus, lymph nodes, and bone marrow, but not to MPG-11 cells. RAT-1 inhibited the formation (approximately 90%) of direct and indirect plaque-forming cells (PFC) and rosette-forming cells, and this inhibition was abolished by absorption with normal marrow cells. MPR-11 cells expressed less than 10% of the amount of Bl antigen present in normal spleen cells. RAT-1 strongly inhibited PFC in the spleens of BALB/c, DBA/2, C57BL/6, and A/J mice, but only slightly in C3H and not at all in AKR/J and SJL/J. Over 90% of the antibody activity against H-2 determinants was absorbed with MPC-11 cells, indicating that the antigen lacking in the myeloma cells is probably not a direct constituent of the H-2 antigen complex. The reduction of Bl antigen from only some murine myelomas indicated that its loss is not obligatory in the neoplastic transformation of B lymphocytes.

4561 THE i ANTIGEN COMPLEX: A NEW SPECIFICITY UNIQUE TO DIVIDING HUMAN CELLS. *(E.)* Thomas, D. B. (Natl. Inst. Med. Res., London, England). *Eur J Immunol* 4(12):819-824, 1974.

Evidence is presented that erythroagglutinin, anti-i, sera recognize a membrane antigen common to fetal erythrocytes and dividing human cells. The determinant, referred to as the i^1 antigen was recognized by the differential reaction of anti-i sera with normal lymphocytes and transformed lymphoblasts. It is present on fetal tissues, cultured cell lines and mitogen-stimulated lymphocytes and absent from normal adult tissues. Cell synchrony studies with cultured mphoblasts indicated that antigen expression is ximal during the S and G_2 phases of the cell cycle. sorption studies showed that antibodies to this terminant are distinct from the erythroagglutinin tivity of sera. The existence of distinct division embrane antigens in man leads to speculation on ether oncofetal or tumor antigens are the normal oducts of cellular proliferation rather than aber-nt products of malignancy. It is a matter of con-ecture whether antigenic differences between normal dult tissues and proliferating embryonic or tumor issues are necessarily a function of neoplastic ransformation and/or dedifferentiation. It is sug-ested that anti-i sera may provide a means for es-imating relative numbers of proliferative and quies-ent cells in a given tissue.

562 THYMUS-ANTIGEN- AND IMMUNOGLOBULIN- POSITIVE CELLS IN LYMPH-NODES, THYMUS, AND MA-IGNANT LYMPHOMAS OF NZB/NZW MICE. *(E.)* Greenspan, . S. (Sch. Dent., Univ. California, San Francisco), . A. Gutman, N. Talal, I. L. Weissman and S. Sugai. *lin Immunol Immunopathol* 3(1):32-51, 1974.

ymph node and thymic architecture in NZB/NZW mice ged 16, 24, 54, and 65 weeks was examined using ight microscopy and immunofluorescence techniques apable of detecting cell-associated immunoglobulin nd thymus antigen. Two spontaneously arising malig-ant lymphomas in NZB/NZW males were also examined sing the same techniques. Beginning at about 27 eeks, lymphoid cells began to collect in the medulla f the thymus, which showed a relative increase in he proportion of the thymus occupied; the thymic cortex showed a concomitant reduction in size, and he numbers of epithelial cells and Hassall's cor-uscles were reduced. Both epithelial cells and their associated lymphocytes showed degenerative changes with age. Beginning at nine weeks, the spleen began to enlarge due to the presence of numerous markedly enlarged malpighian corpuscles and the lymph nodes underwent progressive and extensive hyperplasia involving lymphocytes of both types as well as some cells lacking either surface antigen. By 30 weeks, the architecture of the lymph nodes was grossly abnormal with varied and abnormal cell populations. The two malignant lymphomas contained large numbers of macrophages; these lymphomas were composed exclusively of thymus-antigen negative and immunoglobulin-positive cells, as confirmed by immunofluorescence and a cytotoxicity assay.

4563 HETEROGENEITY OF CARCINOEMBRYONIC ANTIGEN. *(E.)* Eveleigh, J. W. (Oak Ridge Natl. Lab., Tenn.). *Cancer Res* 34(8):2122-2124, 1974.

Perchloric acid extraction and affinity chromatography were used to prepare a pure sample of carcinoembryonic antigen (CEA) from the liver metastasis of a human colonic carcinoma. DEAE-cellulose chromatography revealed the presence of five major radioactive components in the CEA fraction. Rechromatography of these components on long narrow columns of DEAE-cellulose resolved a total of eight major labeled compounds and several minor constituents. Acidic extraction of the original tumor tissue gave a larger preponderance of the more basic components. All purified proteins showed immunological activity against goat anti-CEA serum by Ouchterlony double diffusion. Acrylamide gel electrophoresis and gel chromatography of the first four proteins showed them to be fairly pure, but CEA_4's and CEA_5's remained grossly contaminated with other proteins. With the exception of these two proteins, the other components showed identical elution profiles from Sephadex G-200. The components did, however, differ in overall ionic charge and in amino acid composition; marked differences were found in the relative proportions of cystine, tyrosine, methionine, lysine, histidine, and glutamic acid. The CEA-inhibitory activity (expressed as mg/mg total protein) varied from 0.563 for CEA_3 to 0.183 for CEA_{1B}.

4564 CORRELATION OF CARCINOEMBRYONIC ANTIGEN CONTENT WITH CARBOXYLESTERASE ACTIVITY IN BENIGN AND MALIGNANT HUMAN TISSUES. *(E.)* Munjal, D. (Boston City Hosp., Mass.), N. Zamcheck, H. Z. Kupchik and C. A. Saravis. *Cancer Res* 34(11): 2936-2939, 1974.

Carcinoembryonic antigen (CEA) activity in normal and malignant human digestive tissues was quantitated by radioimmunoassay and carboxylesterase (CE) activity was quantitated by chemical and immunochemical methods. Of the normal tissues tested, colon had the highest CEA and CE activities (82-152 ng/mg protein and 90-350 U/mg protein, resp.). Primary carcinomas (especially gastric carcinoma) had higher CEA activity (40-1080 mg/mg protein) and higher CE activity (46-470 U/mg protein) than did normal pancreas and liver. Normal colon tissues had higher CEA levels than did primary cancers of the lung, liver, and pancreas. CEA (100-42,000 ng/mg protein) and CE (102-855 U/mg protein) activities of metastic tumors were uniformly higher than those of the primary lung, liver, and pancreatic tumors. A significant correlation between CEA and CE activities in individual tissues was demonstrated. Thus, esterase activity may be either a biological activity of CEA or derived from an enzyme(s) closely associated with CEA.

4565 FREE AND BOUND CARCINOEMBRYONIC ANTIGEN IN NEOPLASMS AND IN NORMAL ADULT AND FETAL TISSUE. *(E.)* Dyce, B. J. (Los Angeles Cty.-Univ. Southern California Med. Cent., Los Angeles) and B. J. Haverback. *Immunochemistry* 11(8):423-430, 1974.

Low ionic strength radioimmunoassay was used to measure the concentrations of carcinoembryonic antigen (CEA) in normal adult and fetal lung, liver, and colonic mucosa, and primary adencarcinomas and/or metastases from the rectum, colon, pancreas, stomach, lung, breast, prostate, gallbladder, and ampulla of Vater. In the normal adult tissues, CEA was present in the greatest concentrations in the lung (300 ng/g), and in the fetal tissues it was most plentiful in the colon (1000 ng/g). In the cancer tissues, the highest levels were found in primary and metastatic carcinomas of the colon (850-92,800 ng/g). Blood levels of CEA may reflect the concentration of the antigen in the cancer tissue as well as the relative quantity of cancer tissue. Purification of CEA via polyacrylamide gel electrophoresis and isoelectric focusing indicated the presence of at least six antigens which differ in isoelectric point or molecular weight. A perchloric acid extract of one gastric hepatic metastatic adenocarcinoma contained no demonstrable CEA using double immunodiffusion techniques; however, following exposure of this perchloric acid precipitate to 15% NaCl, CEA was demonstrable by double immunodiffusion and radioimmunoassay showed an increase from 53 to 5750 ng/g. This phenomenon was repeated with a number of other carcinomas as well as with normal adult tissue. Thus, dissociation techniques should probably be employed when studying the level of CEA in the blood or tissues.

4566 CERVICAL CARCINOMA ANTIGEN AND THE RELATIONSHIP TO HSV-2.

(E.) Gall, S. A. (Duke Univ. Med. Cent., Durham, N.C.) and H. G. Haines. *Gynecol Oncol* 2(4):451-459, 1974.

Two antigens associated with invasive squamous cell carcinoma of the cervix were identified by immunological techniques and their relationship to herpes simplex virus type-2-induced antigens was investigated. All tumors tested (25 different epidermoid cervical carcinomas) contained one antigen which appeared to be specific for cervical carcinoma. A second antigen which cross-reacted with ovarian and vulvar carcinoma was found in 20/25 (80%) of the tumors tested. Cervical carcinoma antigen and its antibody were tested for cross-reactivity with herpes simplex virus type-1 and type-2 and their antiserum using immunodiffusion, counter-immunoelectrophoresis and immuno-fluorescent techniques. Cervical carcinoma antigen prepared by either saline or perchloric acid extraction showed a line of identity with a herpes simplex virus type-2 antigen when reacted against anti-herpes simplex virus type-2. Extracts of normal cervical tissue, breast and ovarian tissue as well as extracts of breast and colon cancer did not form precipitin lines. Anti-cervical carcinoma antigen did not show a precipitin reaction when reacted with herpes simplex virus type-2 preparations. It is concluded that the presence of tumor-associated antigens has been demonstrated in cervical, vulvar and ovarian carcinoma. In addition, an immunological relationship has been shown between herpes simplex virus type-2 and extracts from cervical carcinoma and the question of a common etiological agent raised.

4567 DETECTION OF VIRAL ANTIGENS IN HUMAN LEUKEMIA.

(Fr.) Viza, D. (Pitie-Salpietriere Fac. Med., Paris, France), D. Catovsky, L. Trejdosiewicz, J. Phillips and A. J. Collard. *C R Acad Sci [D] (Paris)* 279:531-534, 1974.

Leukemia cell membrane extracts and sera from leukemic patients were tested with antisera to murine and feline leukemia and sarcoma viruses by immunodiffusion, electrosynuresis, immunofluorescence and complement-fixation tests. Moloney leukemia virus and three strains of feline leukemia virus (Gardner, Theilen and Rickard) were used, along with a horse antiserum to feline leukemia virus (Jarrett). Two of five leukemia cell extracts, i.e. those from patients with acute myeloblastic leukemia, reacted with anti-Rauscher and anti-Gardner antiviral antisera in the immunodiffusion test. Twenty-two per cent of the leukemic sera and 14% of sera from non-leukemic subjects were positive in the electrosynuresis test. A number of sera that were positive in the electrosynuresis tests were negative in the complement-fixation test, but all sera that were negative in the electrosynuresis test remained so in the complement-fixation test. The results of the complement-fixation tests are compatible with the presence of an interspecies viral specificity. Immunofluorescence tests confirmed the reactivity of the antisera with blasts of certain patients that had positive complement-fixation and electrosynuresis tests. The results suggest the existence of a type C viral antigen in human leukemia cells and in the serum of certain leukemic and non-leukemic subjects. It was impossible to establish any correlation between the histologic type of the leukemia and the presence of gs 3 in the electrosynuresis test, or between the presence of this viral antigen and the leukemo-embryonic or leukemic specificities.

4568 SEPARATION OF THE MAJOR HISTOCOMPATIBILITY ANTIGENS FROM OTHER ANTIGENS PRESENT ON HUMAN LEUKEMIC AND WHITE BLOOD CELL MEMBRANES.

(E.) Hollinshead, A. C. (George Washington Univ. Med. Cent., Washington, D. C.) and R. B. Herberman. *Bibl Hematol* (39):828-837, 1973.

The relative efficiencies of enzymatic digestion with papain or sonication for release and separation of soluble histocompatibility (HL-A) antigens from a human lymphoic tissue culture cell line, RPMI-4265, were compared. A single preparation of RPMI-4265 membranes containing 300 mg protein was used for these studies; half of each membrane preparation was treated with papain and the other half was sonicated. Sequential papain digestions were for periods of one hr; sequential sonication periods were 3, 1-1/2, and 1-1/2 min, resp. When the supernatants of the sonicated and papain digested lymphoid tissue culture cell membranes were separated on Sephadex G-200, most of the specific alloantigenic activity of the sonicated material was found in the first high molecular weight fraction. The alloantigenic specificities in the papain digestion preparation were found in the lower molecular weight fractions 2 and 3, as well as in fraction 1. Thus, papain digestion produced smaller molecular fragments than did sonication. Total specific HL-A activity recovered after separation of both supernatants was comparable. Epstein-Barr virus-associated complement-fixing antigens were also found in fraction 1 of the separated sonicate. The complement-fixing antigens could be separated from HL-A antigens in this fraction using polyacrylamide gel electrophoretic methods involving the stacking of four gels. Whether antigens which produce positive delayed skin reactions in the autochthonous host have the same or different distribution patterns from HL-A antigens in separated material was investigated in a patient with chronic lymphocytic leukemia and in a normal adult volunteer. HL-A content did not correlate well with the skin reactivity produced by the preparations in the leukemia patient or in the normal subject. The results indicate that at least some of those antigens involved in producing delayed hypersensitivity skin reactions can be obtained in soluble form and that it may be possible to separate such antigens from HL-A for further study.

4569 CELLULAR CYTOTOXICITY REACTIONS TO HUMAN LEUKEMIA ASSOCIATED ANTIGENS. *(E.)* Herberman, R. B. (Natl. Cancer Inst., Bethesda, Md.) and E. B. Rosenberg. *Bibl Hematol* (39):838-845, 1973.

Cellular immune reactions to human acute leukemia-associated antigens were studied with a lymphocyte-mediated cytotoxicity assay. Eight patients with acute lymphocytic leukemia and eight with acute myelogenous leukemia were studied. Leukemic blast cells from bone marrow or peripheral blood were obtained prior to therapy, frozen in the presence of 10% dimethyl sulfoxide and stored in liquid nitrogen. After chemotherapy and when no blasts were circulating, autochthonous peripheral blood lymphocytes were tested for cytotoxic reactivity against the blast cells. Reactivity was demonstrated in five of 12 tests with acute lymphocytic leukemia blasts, and with four of 13 tests with acute myelogenous leukemia. Studies of allogeneic reactivity were performed with ten sets of identical twins, one member of each pair having leukemia, thereby providing comparable normal cells to control for the leukemic cells. With seven of the twin pairs, effector lymphocytes were found to be cytotoxic for target cells from the leukemia patients but not for cells from the normal twins. Leukemia-associated antigens were detected on remission cells of leukemic patients, as well as on blast cells. The data indicate that the remission cells may have different antigens than the blast cells. Autologous reactivity was seen only to blast cells and not to remission cells. The presence of leukemia-associated antigens on remission cells is consistent with the previously proposed viral etiology hypothesis regarding human leukemia. Also consistent with the viral hypothesis is the finding of a significantly higher incidence of allogeneic reactivity in adults than in children.

4570 LEUKEMIA-ASSOCIATED ANTIGENS IN MAN: DETECTION BY ANTIBODIES IN MATERNAL SERA. *(E.)* Cullen, P. R. (Radcliffe Infirm., Oxford, England) and D. Y. Mason. *Clin Exp Immunol* 17(4):571-586, 1974.

The characteristics of a membrane antigen found on malignant lymphocytes in chronic lymphatic leukemia (CLL) are described, along with the effects of this antigen on cultures of human malignant cells. Complement-dependent cytotoxicity tests using serum from a healthy pregnant woman were used to test for the presence of the antigen on lymphocytes from CLL patients, on lymphocytes from patients with acute leukemia, reticulosis, and other diseases, and on lymphocytes from normal, healthy subjects. This serum was not cytotoxic to the lymphocytes from the normal subjects, but it was cytotoxic to the lymphocytes of 30 out of 31 CLL patients during some stage in their illness. In the CLL patients, high cytotoxicity scores tended to correlate with high peripheral lymphocyte counts at the time of testing. Positive cytotoxicity tests were obtained with the lymphocytes of patients with acute leukemia only when the patient's blood contained circulating blast cells at the time of testing. Of 24 patients with various reticuloses, positive tests were obtained only with the lymphocytes from a patient with Hodgkin's disease and a patient with lymphosarcoma. There was no positive reaction with gastric adenocarcinoma cells or malignant plasma cells from a patient with plasma cell leukemia. Positive reactions were also obtained in two cases of infectious mononucleosis and in one patient on chronic dialysis for lupus nephritis. The antigen was not found on neonatal cord lymphocytes, neonatal thymus cells, neonatal lymph node lymphocytes, or the lymphocytes of either parent of a strongly-positive CLL patient. The antigen was found on cultured Burkitt's lymphoma cells, and similar antibody activity was found in a number of HL-A typing antisera; it could not be separated from the HL-A specificity by absorption. The results suggest that the antigen recognized by serum P.W. may be present in masked or repressed form on many human cells and that it may be revealed by a variety of conditions.

4571 HUMAN LEUKEMIA ANTIGEN. II. PURIFICATION. *(E.)* Billing, R. (Sch. Med., Univ. California, Los Angeles) and P. I. Terasaki. *J Natl Cancer Inst* 53(6):1639-1643, 1974.

Cytotoxicity inhibition of leukemia-specific antisera was used to measure antigenic activity in papain digests from human lymphomas. The antigen has been found on human lymphoma tissue, human leukemia cells, and cultured RAJI cells, but not on normal cells. The crude papain digests could be purified rapidly by affinity chromatography with concanavalin A bound to Sepharose 4B. The leukemia antigen bound to the affinity column was a glycoprotein which, labeled with ^{125}I, yielded essentially one peak on 12 and 15% sodium dodecyl sulfate polyacrylamide gel electrophoresis with or without reduction with 2-mercaptoethanol. The molecular weight of the antigen from these gels was estimated at 27,000. Native analytic polyacrylamide gel electrophoresis was not possible because of aggregation of the antigen even in the presence of 8 M urea, but limited preparative electrophoresis showed essentially one peak of antigenic activity. The antigenic activity of the lymphoma extract was measured in terms of its ability to inhibit the cytotoxicity of the specific leukemia antisera. The mean inhibitory dose of the crude antigen was 0.017 μg/μl, while the mean inhibitory dose of the purified material was 0.004 μg/ml. The highly purified material might have clinical potential with regard to immunostimulation, immunization, and immunodiagnosis by skin testing and radioimmune assay.

4572 PARTIAL PURIFICATION AND CHARACTERIZATION OF THE SV40 T ANTIGEN. *(E.)* Henderson, I. C. (Natl. Cancer Inst., Bethesda, Md.) and D. M. Livingston. *Cell* 3(1):65-70, 1974.

Comparison of specific T antigen immunoreactivity of simian virus 40 (SV40)-infected cell lines and induced tumors showed that activity was highest in a human fibroblast line (SV80). The SV80 antigen was partially purified by salt fractionation and adsorbent chromatography; it exists in the form of a high molecular wt aggregate in nondenaturing solvents. The antigen binds to phosphocellulose but not carboxymethylcellulose at pH 6.2, suggesting that it may have specific affinity for phosphate ligands but is not a basic protein. This property could be consistent with a specific role for T antigen in some chemical processes involving binding of nucleic acids, nucleotide polymerization, or metabolism.

4573 DEFECTIVE MONOCYTE CHEMOTACTIC RESPONSE IN GENITOURINARY CARCINOMA. *(E.)* Brosman, S. (Harbor Gen. Hosp., Torrance, Calif.) and M. S. Hausman. *Urology* 4(2):129-134, 1974.

Chemotaxis assays, which allow the quantitation of monocyte function, were used to study the activity of these cells in 36 patients with renal adenocarcinoma and transitional-cell carcinoma of the bladder and in 40 healthy volunteers and patients with non-neoplastic diseases. The mean chemotactic response of the control population was 82.6 cells per oil field; the response did not differ significantly with age or sex. Twenty-four patients with various stages of renal carcinoma exhibited a mean chemotactic defect of 52.6%, which represents a significant deviation from control values. Twelve patients with transitional-cell carcinoma showed a mean chemotactic defect of 29.8%; this also showed a significant deviation from control values. There was no correlation in either group between tumor stage and degree of chemotactic defect, although in the renal cell carcinoma group the chemotactic response appeared to become less severe with advancing age. These findings of a significant defect in the ability of monocytes to migrate normally in patients with carcinoma of the kidney and bladder suggest that the macrophage may play a more important role in the early stages of tumor cell extablishment than has yet been realized.

4574 B-CELL MARKERS ON LYMPHOBLASTS IN ACUTE LYMPHOBLASTIC LEUKAEMIA. *(E.)* Gajl-Peczalska, K. J. (Dep. Lab. Med., Pathol., Univ. Minnesota, Minneapolis), C. D. Bloomfield, M. E. Nesbit and J. H. Kersey. *Clin Exp Immunol* 17(4):561-569, 1974.

A single case of B-cell type acute lymphoblastic leukemia (ALL) occurring among 35 untreated cases of ALL is described. The patient was a 75-yr-old man with splenomegaly but not lymphadenopathy. The cells obtained from the buffy coat of the peripheral blood showed intense immunofluorescent staining with surface-associated lambda-light chain on 92.5% of the cells and mu-heavy chain on 85%. There was no intracytoplasmic immunoglobulin and no evidence of monoclonal immunoglobulin. The patient showed rapid lysis of malignant cells. The peripheral blood contained 15% B lymphocytes and 57% T lymphocytes. Lymphoblasts were found in the bone marrow at autopsy. The remaining 34 cases of ALL studied showed normal proportions and numbers of B-lymphocyte subpopulations. Twenty-four of these patients were studied for T cells; 4 were found to have ALL of T-cell origin, while the rest had T lymphocytes in decreased numbers. Of the 34 cases of ALL of T-cell of undefined origin, all were young adults or children. The results suggest that in older ALL patients, like in older patients with other malignancies, the disease may be of B-cell origin more often than in younger patients.

4575 A MICROASSAY FOR HUMORAL CYTOTOXICITY DEMONSTRATING SUBLETHAL EFFECTS OF ANTIBODY. *(E.)* Cleveland, P. H. (Dep. Microbiol., Univ. Minnesota, Minneapolis), C. F. McKhann, K. Johnson and S. Nelson. *Int J Cancer* 14(3):417-426, 1974.

A sensitive and objective microassay for the detection of antibodies against tumor-associated antigens of murine sarcoma cells is described. Ten methylcholanthrene tumors and Moloney sarcoma virus (MSV)-induced tumors were incubated with immune or normal serum and complement and their ability to incorporate ^{3}H-thymidine was measured. Thymidine incorporation by the various tumors was specifically inhibited by incubation with their various immune sera, maximum cytotoxicity being generally greater than 90% at high serum concentrations. Representative results were obtained with the MCA-induced MBE$_1$ and MBE$_2$ tumors (both derived from the same tumor) and their respective antisera. Undiluted anti-MBE$_1$ serum plus complement was cytotoxic for MBE$_1$ and MBE$_2$, but not for three other MCA-induced tumors, and absorption of 1.5 ml of a 1/800 dilution of anti-MBE$_1$ serum with 8×10^6 cells of the same tumor completely eliminated the cytotoxicity for that tumor, while absorption with other tumor cells only slightly lowered the cytotoxicity for MBE$_1$. Tests for specificity of antibody by cross-reactivity and cross-absorption indicated that the MBE$_2$ tumor contained an embryonic antigen. Maximum cytotoxicity was obtained after prolonged (more than 4 hr) exposure of the various tumor cells to their respective antisera and complements. The cytotoxic effect detected by this method reflected cytostatsis as well as cell death. This assay is simple, objective, highly sensitive and reproducible, requiring only small volumes of antisera and few target cells.

4576 LYMPHOCYTE STIMULATION IN CHRONIC LYMPHATIC LEUKEMIA. *(Fr.)* Franco Conte, P. (Inst. Med. Symptomatol., Univ. Turin, Italy) and A. Pileri. *C R Acad Sci* [D] *(Paris)* 279:1329-1332, 1974.

Differences in the uptake of ^{3}H-actinomycin D, were studied in T- and B-lymphocytes from the peripheral blood of three patients with chronic lymphatic leukemia and one normal subject. The response of T-lymphocytes from leukemic patients to phytohemagglutinin (PHA) was compared with the response of normal lymphocytes. The mitosis of both normal and leukemic T-lymphocytes was stimulated most by PHA but they took up less actinomycin D in their nuclei than did three other fractions containing progressively fewer T-lymphocytes. When incubated for 24 hr with PHA (50 μg/ml), cultures of total lymphocytes from patients with chronic lymphatic leukemia took up little or no actinomycin D, while normal lymphocytes began to take up actinomycin D after two hr. Activation of chromatin by PHA also occurred later and to a lesser extent in leukemic than in normal lymphocytes. To determine whether this delay in chromatin activation in leukemic cells is due to cellular abnormalities or to the small number of T-lymphocytes in the leukemic population, decreasing concentrations of normal lymphocytes were cultivated *in vitro* and their chromatin activation measured. The percentage of cells with activated chromatin was proportional to the cell concentration, suggesting that the delay in chromatin activation and in proliferative response of T-lymphocytes in leukemia might be due to the small number of T-lymphocytes in leukemic blood.

4577 ORIGIN OF MALIGNANT LYMPHOMAS.

(E.) Lennert, K. (Inst. Pathol., Univ. Kiel, West Germany). *Lancet* (7880):586, 1974.

Early infiltration of lymph nodes was studied in eight cases of hairy-cell leukemia (leukemic reticuloendotheliosis) and eight cases of Sezary syndrome. The infiltration in hairy-cell leukemia was chiefly confined to the outer cortex, with the tertiary nodules at least partially intact in most cases. In Sezary syndrome the first infiltration took place in the tertiary nodules (paracortical area); apart from the influx of Sezary cells through the afferent lymphatics, the primary and secondary nodules were not affected. These findings favor the B-cell origin of hairy-cell leukemia and the T-cell origin of Sezary syndrome.

4578 STUDY OF SUBMICROSCOPIC STRUCTURE OF NUCLEOLI IN PERIPHERAL BLOOD LYMPHOCYTES FROM HEALTHY PEOPLE AND PATIENTS WITH CHRONIC LYMPHATIC LEUKEMIA.

(Rus.) Talelenova, N. N. (Cent. Inst. Hematol. Blood Transfus., Moscow, USSR) and I. A. Bykova. *Probl Gematol Pereliv Krovi* 18(6):22-28, 1973.

Peripheral lymphocytes taken from 20 healthy subjects and 20 patients with chronic lymphatic leukemia were examined electron microscopically before and during short-term culturing (24, 48, 72 hr) with and without phytohemagglutinin (PHA). Before culturing and when cultured in the absence of PHA, lymphocyte nuclei of healthy subjects and leukemia patients have nucleoli with an identical ultrastructure. Most of the nucleoli are ring-shaped with ribonucleoprotein particles located along their periphery; this is characteristic of inhibited RNA synthesis. During culturing with PHA, the nucleoli of blast-transformed lymphocytes showed an increase of the granular component and a more highly developed nucleolonema. The nucleoli tended to move closer to the nuclear membrane. In 72-hr cultures, nucleoli had increased in size (diameter 4-7 μ) until some of them occupied one-third of the area of the nucleus, and the number of nucleoli/nucleus increased (mean 1.30 ± 0.04). When cultivated in the presence of PHA, the nucleoli of blast-transformed lymphocytes from patients with lymphatic leukemia exhibited the same changes as those from normal subjects.

4579 MIXED LYMPHOID CELL-TUMOR CULTURE REACTION. I. STIMULATION OF RAT LYMPHOID CELLS BY LIVER CELL STRAINS MALIGNANTLY TRANSFORMED *IN VITRO*.

Fujii, G. (Inst. Med. Sci., Univ. Tokyo, Japan), T. Nishihira, I. Osada and M. Sekiguchi. *Jpn J Exp Med* 44(4):347-357, 1974.

JAR-1 rat peripheral lymphoid cells were cultured with irradiated syngeneic tumor cells (obtained by *in vitro* treatment with 4-nitroquinoline 1-oxide) in a medium consisting of 90% RPMI 1640 and 10% fresh rat serum. The lymphoid cells were stimulated by the tumor cells in the mixed culture, incorporation of ^{3}H-thymidine into the stimulated cells increasing and reaching a peak on the sixth day. Rat lymphoid cells were also stimulated by normal rat liver cells, but the uptake of ^{3}H-thymidine by the lymphoid cells was much lower under these circumstances. Neither irradiated rat lymphoid cells nor irradiated rat liver cells stimulated the autologous lymphoid cells *in vitro* although lymphoid cells from tumor-bearing rats responded *in vitro* to syngeneic liver tumor cells. The degree of stimulation was always lower than that observed in lymphoid cells from normal rats. Rat liver tumor cells obtained by reculturing spontaneously transformed cells also stimulated the syngeneic rat lymphoid cells, the degree of stimulating activity differing greatly from strain to strain. This suggests that different tumor antigens may be produced by different 4-nitroquinoline 1-oxide treatment programs. The mixed lymphocyte-tumor culture reaction appears to be a useful model for studying the inductive phases of the immune response of lymphocytes against syngeneic and autochthonous tumor cells.

4580 LYMPHOCYTE PROLIFERATION INHIBITED BY CELLS AND BY EFFECTOR SUBSTANCES OBTAINED FROM BURSAL LYMPHOCYTES.

(E.) Danielson, J. R. (Univ. Illinois Med. Cent., Chicago) and P. J. Van Alten. *Prog Exp Tumor Res* 19:194-202, 1974.

The responses of splenic lymphocytes to phytohemagglutinin stimulation in the presence of autologous bursal cells was investigated. The spleen and bursa of normal White Leghorn chickens, age 4-10 weeks, were prepared as single cell suspensions. When splenic lymphocytes were cultured in the presence of bursal lymphocytes, there was a marked decrease in the uptake of ^{3}H-thymidine by the phytohemagglutinin-stimulated cells at both three and four days of culture. When splenic cells alone were cultured with phytohemagglutinin, there was more than a 30-fold increase in DNA synthesis when compared to unstimulated controls. In studies undertaken to determine cell survival of cultured splenic and bursal lymphocytes and mixtures of the two, both bursal cells and splenic cells survived three and four days in culture. When splenic and bursal cells were mixed together, a decrease in surviving cells was observed but this decrease had no relationship to the numbers of bursal cells present in the cultures. It is concluded that the impaired ability to synthesize DNA by stimulated cultures containing a mixture of splenic and bursal lymphocytes cannot be attributed to an excessive death of bursal lymphocytes. After splenic and bursal cells had been cultured together for three days without phytohemagglutinin, the cells were removed and the supernatant added to a fresh splenic lymphocyte culture. There was a decreased uptake of ^{3}H-thymidine by phytohemagglutinin-stimulated splenic cells when small amounts of the supernatant were added to the culture. When bursal lymphocytes were cultured without phytohemagglutinin for 20 hr, and added to a fresh splenic lymphocyte culture, DNA synthesis was inhibited. These results indicate that the bursal cells contain a soluble factor which inhibits DNA synthesis. No soluble inhibitory substance was found in culture fluids containing only splenic lymphocytes. It is concluded that cultures of unstimulated bursal cells contain a soluble mediator capable of inhibiting the proliferative response of phytohemagglutinin-stimulated splenic lymphocytes. It is postulated that this bursal inhibitory factor, along with antibody, may have an important regulatory role on T lymphocyte proliferation *in vivo*.

4581 SURFACE MARKERS ON HUMAN B AND T LYMPHOCYTES. IV. DISTRIBUTION OF SURFACE MARKERS ON RESTING AND BLAST-TRANSFORMED LYMPHOCYTES. *(E.)* Jondal, M. (Dep. Tumor Biol., Karolinska Inst., Stockholm, Sweden). *Scand J Immunol* 3(6):739-747, 1974.

The distribution of surface immunoglobulin and receptors for Fc, C3, and sheep erythrocytes on resting and blast-transformed peripheral lymphocytes was investigated. Sheep erythrocyte receptors were retained on all blast-transformed T lymphocytes. No such receptors were found on normal or neuraminidase-treated lymphocytes. Receptors for Fc and C3 were found on the same resting lymphocytes, which formed a subpopulation that did not entirely overlap with surface immunoglobulin-positive B cells. Owing to this and the fact that Fc/C3 receptors were lacking on almost all B blast cells, it is argued that caution must be taken when these receptors are used as B-cell markers. A comparison among C3 indicator cells prepared with human or mouse complement showed that these detected the same lymphocyte subpopulation. B blast cells, induced by 72-hr pokeweed nitrogen cultures, were found to carry detectable amounts of surface immunoglobulin. Phagocytic leukocytes were conveniently detected by scoring the number of cells with internal C3 indicator cells after osmotic lysis of externally bound indicator cells. It is concluded that in using sheep erythrocyte receptors as a criterion for T cells and surface immunoglobulin as a B-cell criterion almost all lymphocytes and lymphoblasts may be classified with no overlapping of these markers. If this holds true for *in vivo*-induced lymphoblasts, it may be possible to obtain information about activation of the immune system under different clinical conditions by using these surface markers.

4582 VARIATION IN PEROXISOMAL ENZYME LEVELS OF PERIPHERAL LEUKOCYTES OF CANCER, LEPROSY, AND TUBERCULOSIS PATIENTS. *(E.)* Hokama, Y. (Sch. Med., Univ. Hawaii, Honolulu), L. H. Kimura, T. Y. Kobara, S. M. Perreira, D. W. P. Su, C. Torikawa and N. Oishi. *Cancer Res* 34(10):2784-2789, 1974.

Fluorometric analysis was used to determine the activities of D-amino acid oxidase (DAAO), urate oxidase (UO), L-α-hydroxy acid oxidase (OHAO), and peroxidase in homogenates of peripheral leukocytes from normal subjects and from patients with lymphosarcomas, various carcinomas, leukemias, leprosy and tuberculosis. DAAO was significantly elevated in the leukocytes of active lepromatous and recovered tuberculosis patients. OHAO and peroxidase were significantly depressed in the leukocytes of cancer and lepromatous inactive patients. Catalytic activity was significantly increased in the active tuberculoid leprosy patients and decreased in the cancer patients. In normal individuals, the leukocyte enzyme levels were significantly higher in males than females. OHAO, peroxidase, and catalase were higher in females with tuberculosis than in males with tuberculosis, and OHAO and peroxidase were significantly lower in female cancer patients than in male cancer patients. In general, the leukocyte enzymes were more depressed in the male patients than in the female patients. OHAO was significantly depressed in all types of cancer by lymphosarcoma. DAAO was severely depressed in leukemia, but increased in lymphosarcoma, gastrointestinal carcinoma, and lung carcinoma. Peroxidase was depressed in leukemia, breast cancer, and urogenital carcinoma, while catalase was depressed only in leukemia. In most cases, all enzymes returned to normal levels after surgery or during therapy. Measurement of OHAO and the azide-insensitive peroxidase may serve as a useful indicator of the disease process. It is also suggested that the depression of some of the hydrogen peroxide-generating oxidases, peroxidase and catalase, may contribute to the low state of the host defense mechanism.

4583 STRUCTURAL PROTEINS OF MAMMALIAN ONCOGENIC RNA VIRUSES: IMMUNOLOGICAL CHARACTERIZATION OF THE p15 POLYPEPTIDE OF RAUSCHER MURINE VIRUS. *(E.)* Strand, M. (Albert Einstein Coll. Med., Bronx, N.Y.), R. Wilsnack and J. T. August. *J Virol* 14(6):1575-1583, 1974.

4584 CHEMICAL STUDIES OF THE GROUP-SPECIFIC POLYPEPTIDES OF TWO AVIAN RNA TUMOR VIRUSES. *(E.)* Herman, A. C. (Duke Univ. Med. Sch., Durham, N.C.) and T. C. Vanaman. *Fed Proc [II]* 33(5):1603, 1974.

4585 IMMUNOLOGIC ASPECTS OF MURINE ALLOGENEIC TUMOR GROWTH. *(Sp.)* Braun, M. (Inst. Hematol. Stud., Natl. Acad. Med., Buenos Aires, Argentina), F. Saal and C. D. Pasqualini. *Sangre* 19(2):153-157, 1974.

4586 LOSS OF INDUCED IMMUNORESISTANCE TO VIRAL LEUKEMIA IN SPLEEN CELLS TRANSPLANTED INTO LETHALLY IRRADIATED MICE. *(E.)* O'Kunewick, J. P. (Allegheny Gen. Hosp., Pittsburgh, Pa.), P. M. Kuhnert, E. L. Phillips and B. Brozovich. *Radiat Res* 59(1):216, 1974.

4587 EFFECT OF ANTI-4-AZOQUINOLINE 1-OXIDE ANTIBODY ON IMMUNOSUPPRESSION BY 4-HYDROXYAMINOQUINOLINE 1-OXIDE. *(E.)* Nakashima, S. (Fac. Pharm. Sci., Toyama Univ., Japan), S. Ono and H. Hayashi. *Gann* 65(5):411-416, 1974.

4588 INDUCTION OF SOLUBLE FACTOR(S) BY FREUND'S COMPLETE ADJUVANT. *(E.)* Barry, K. (Univ. Manitoba, Winnipeg, Canada). *Diss Abstr Int B* 35(5):2274-2275, 1974.

4589 LYSINE CONTAINING COMPOUNDS IN SPLEEN OF BALB/c MICE IN RESPONSE TO ANTIGENIC STIMULI. *(E.)* Mashburn, L. T. (Res. Inst. Hosp. Joint Dis., New York, N.Y.). *Fed Proc [II]* 33(5): 1604, 1974.

4590 TUMOR-SPECIFIC IMMUNOGENICITY OF TRANSPLANTABLE CHEMICALLY INDUCED TUMORS, AS DEMONSTRATED BY UPTAKE OF TRITIATED THYMIDINE BY LYMPHOID CELLS FROM ISOGENIC AND F_1 HYBRID MICE. *(E.)* Phillips, M. E. (Health Sci. Cent., State Univ. New York, Stony Brook). *J Natl Cancer Inst* 52/53(1/6):1665-1670, 1974.

4591 THE EFFECT OF CHRONIC THORACIC DUCT DRAINAGE ON CELL ANTIGENICITY. *(E.)* Mandel, M. A. (Univ. Hosp. Cleveland, Ohio). *J Surg Oncol* 6(6):501-509, 1974.

4592 THE ISOLATION AND CHARACTERIZATION OF TUMOUR ASSOCIATED ANTIGENS. *(E.)* Price, M. R. (Cancer Res. Campaign Lab., Univ. Nottingham, Univ. Park, London, England), J. G. Bowen and R. W. Baldwin. *Br J Cancer* 29(6):493-494, 1974.

4593 AN ANTIGEN-BINDING CELL TUMOR: HETEROPHILE COLD HEMAGGLUTININ AS A MEMBRANE-BOUND RECEPTOR ON A MOUSE LYMPHOMA. *(E.)* Hiai, H. (Aichi Cancer Cent. Res. Inst., Nagoya, Japan), H. Shisa, Y. Nishizuka and H. Miyawaki. *J Natl Cancer Inst* 52/53(1/6):1703-1711, 1974.

4594 SEPARATION OF THE SPECIFIC ANTIGEN OF A MOUSE LYMPHOMA FROM HISTOCOMPATIBILITY ANTIGENS. *(E.)* Davies, D. A. L. (Searle Res. Lab., High Wycombe, England), V. S. G. Baugh, S. Buckham and A. J. Manstone. *Eur J Cancer* 10(12):781-786, 1974.

4595 A COMMON TUMOUR SPECIFIC ANTIGEN. II. FURTHER CHARACTERIZATION OF THE WHOLE ANTIGEN AND OF A CROSS-REACTING ANTIGEN OF NORMAL TISSUES. *(E.)* Dickinson, J. P. (Newcastle Gen. Hosp., Newcastle upon Tyne, England), J. R. McDermott, J. K. Smith and E. A. Caspary. *Br J Cancer* 29(6):425-432, 1974.

4596 ANTIGENS OF TUMOURS INDUCED BY NATURALLY OCCURRING MURINE SARCOMA VIRUS (MSV-FBJ). II. DETECTION OF CELL-SURFACE ANTIGENS BY INDIRECT MEMBRANE IMMUNOFLUORESCENCE. *(E.)* Jones, D. B. (Robert Jones-Agnes Hunt Orthop. Hosp., Oswestry, England) and M. Moore. *Br J Cancer* 29(2):158-167, 1974.

4597 MURINE TYPE-C VIRUS GROUP-SPECIFIC ANTIGENS: INTERSTRAIN IMMUNOCHEMICAL, BIOPHYSICAL, AND AMINO ACID SEQUENCE DIFFERENCES. *(E.)* Oroszlan, S. (Flow Lab., Inc., Rockville, Md.), M. R. Summers, C. Foreman and R. V. Gilden. *J Virol* 14(6):1559-1574, 1974.

4598 CELL SURFACE ANTIGEN INDUCED BY FRIEND MURINE LEUKEMIA VIRUS IS ALSO IN THE VIRION. *(E.)* Friedman, M. (Albert Einstein Coll. Med., Bronx, N.Y.), F. Lilly and S. G. Nathenson. *J Virol* 14(5):1126-1131, 1974.

4599 VIRION AND NON-VIRION MURINE LEUKEMIA MEMBRANE ANTIGENS: ANALYSIS WITH VIRUS-ABSORBED ANTISERA. *(E.)* Moroni, C. (Friedrich-Miescher-Inst., Basel, Switzerland), M. Robert-Guroff and D. Martin. *Intervirology* 3(5/6):292-304, 1974.

4600 STUDIES ON EPSTEIN-BARR VIRUS-ASSOCIATED ANTIGENS WITH RADIOLABELLED ANTIBODIES. *(E.)* Ernberg, I. (Dep. Tumor Biol., Karolinska Inst., Stockholm, Sweden) and T. D. K. Brown. *Scand J Immunol* 3(6):875, 1974.

4601 THE VARIABILITY IN IMMUNOFLUORESCENT VIRAL CAPSID ANTIGEN ANTIBODY TESTS IN POPULATION SURVEYS OF EPSTEIN-BARR VIRUS INFECTIONS. *(E.)* Geser, A. (Int. Agency Res. Cancer, Lyon, France), N. E. Day, G. B. de-The, B. K. Chew, R. J. Freund, H. C. Kwan, M. F. Lavoue, D. Simkovic and R. Sohier. *Bull WHO* 50(5):389-400, 1974.

4602 DETECTION AND LOCALISATION OF CARCINOEMBRYONIC ANTIGEN (CEA). *(E.)* Deyasi, S. K. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India), B. K. Aikat, U. Sengupta and S. Sehgal. *Indian J Cancer* 11(4):457-461, 1974.

4603 USE OF IMMUNOFLUORESCENCE TO DETECT GROUP-SPECIFIC ANTIGEN IN HUMAN LYMPHOBLAST CELLS CHRONICALLY INFECTED WITH RAUSCHER LEUKEMIA VIRUS. *(Fr.)* Irino, S. (Fac. Med., Univ. Okayama, Japan), J. Uno, I. Miyoshi and K. Hiraki. *C R Soc Biol (Paris)* 168(4/5):629-633, 1974.

4604 PSEUDO B-ANTIGEN IN A CARCINOMA OF THE COLON. *(Ger.)* Hampel, D. (Dr. Georg Benjamin Reg. Hosp., Staaken, East Germany). *Z Aerztl Fortbild (Jena)* 68(17):888-891, 1974.

4605 HEPATITIS ASSOCIATED ANTIGEN IN VARIOUS CLINICAL CONDITIONS ESPECIALLY IN PRIMARY HEPATOMA AND METASTATIC LIVER CANCER. *(E.)* Wakui, K. (Tohoku Univ. Sch. Med., Sendai, Japan), T. Ueno, H. Kumata, H. Suzuki, Y. Tokawa, M. Otsuki, I. Lim, T. Ozeki, H. Tadaki, M. Kaneda, K. Miura, N. Ishida and S. Yamagata. *Tohoku J Exp Med* 114(2):183-188, 1974.

4606 PRIMARY CARCINOMA OF THE LIVER IN A CHILD: HYPERGAMMAGLOBULINEMIA, α_1-FETOPROTEIN AND POSITIVE TEST FOR AUSTRALIA ANTIGEN. *(Sp.)* Rodriguez Cuartero, A. (San Cecilio Clin. Hosp., Granada, Spain), J. Nunez Carril and F. Urbano Jimenez. *Rev Esp Enferm Apar Dig* 44(5):509-520, 1974.

4607 QUANTITATIVE MEASUREMENT AND CHROMATOGRAPHY OF HUMAN URINARY CARCINOEMBRYONIC ANTIGEN ACTIVITY. *(E.)* Wu, J. T. (Univ. Utah Coll. Med., Salt Lake City), A. Madsen and P. F. Bray. *J Natl Cancer Inst* 52/53(1/6):1589-1595, 1974.

4608 ISOLATION AND PARTIAL CHARACTERIZATION OF MACROMOLECULAR URINARY AGGREGATES CONTAINING CARCINOEMBRYONIC ANTIGEN-LIKE ACTIVITY. *(E.)* Nery, R. (Inst. Cancer Res., London, England), R. James, A. L. Barsoum and H. Bullman. *Br J Cancer* 29(6):413-424, 1974.

4609 CARCINOMA OF THE PANCREAS. DETECTION AND MONITORING BY CARCINOEMBRYONIC ANTIGEN (CEA) AND ULTRASONOGRAPHY. *(E.)* Lokich, J. J. (Harvard Med. Sch., Boston, Mass.), P. L. Chawla, E. H. Smith and N. Zamcheck. *Am J Gastroenterol* 62(6):481-487, 1974.

4610 CARCINOEMBRYONIC ANTIGEN (CEA) AND BLOOD GROUP SUBSTANCES IN STOMACH CANCER. *(Ger.)* Denk, H. (Inst. Pathol. Anat., Univ. Vienna, Austria), G. Tappeiner and J. H. Holzner. *Verh Dtsch Ges Pathol* 57:420, 1973.

4611 THE TREATMENT OF CARCINOEMBRYONIC ANTIGEN WITH SODIUM METAPERIODATE. *(E.)* Westwood, J. H. (R. Cancer Hosp., London, England), P. Thomas and A. B. Foster. *Biochem Soc Trans* 2(6):1250-1251, 1974.

4612 THE ROLE OF DISULPHIDE BRIDGES IN THE STRUCTURE AND IMMUNOLOGICAL ACTIVITY OF THE CARCINOEMBRYONIC ANTIGEN. *(E.)* Thomas, P. (R. Cancer Hosp., London, England), J. H. Westwood and A. B. Foster. *Biochem Soc Trans* 2(6):1248-1249, 1974.

4613 GUINEA PIG TUMOR-SPECIFIC NATURAL ANTIBODIES IN NORMAL RABBIT SERA. *(E.)* Borsos, T. (Natl. Cancer Inst., Bethesda, Md.) and S. H. Ohanian. *J Natl Cancer Inst* 52/53(1/6):1827-1829, 1974.

4614 HL-A AND SUSCEPTIBILITY TO ACUTE LYMPHOBLASTIC LEUKAEMIA. *(E.)* Urcan, S. (Inst. Public Health Med. Res., Cluj, Rumania), G. B. Cote and J. H. Edwards. *Ann Genet (Paris)* 17(2):73-76, 1974.

4615 ANTIBODY SPECIFICITY FOR HL-A IN HUMAN MYELOMA SERA AND IMMUNE RABBIT SERA. *(E.)* Smith, G. (Sch. Med., Univ. California, Los Angeles), R. L. Walford and B. Fishkin. *Tissue Antigens* 4(6):595-600, 1974.

4616 TRANSPLANTATION RESISTANCE AND POTENT ANTIBODY PRODUCTION INDUCED IN C3H/He MICE AGAINST C3H/He MAMMARY TUMOR BY CONTINUOUS INFUSION OF SOLUBILIZED ANTIGEN. *(E.)* Takizawa, K. (Inst. Med. Sci., Tokyo, Japan), T. Yamamoto and H. Mitsui. *Gann* 65(6):541-544, 1974.

4617 HOMOCYTOTROPIC ANTIBODY PRODUCTION IN RATS INFECTED WITH MOLONEY LEUKEMIA VIRUS. *(E.)* Cremer, N. E. (Viral Rickettsial Dis. Lab., California State Dep. Health, Berkeley) and G. H. Strejan. *Proc Soc Exp Biol Med* 147(3):671-673, 1974.

4618 HIGH AVIDITY IN LONG-TERM SURVIVORS OF ACUTE LEUKAEMIA. *(E.)* Jose, D. G. (R. Child. Hosp. Res. Found., Melbourne, Australia) and J. H. Colebatch. *Lancet* 2(7884):835-836, 1974.

4619 LYMPHOCYTE DEPENDENT CYTOTOXIC ANTIBODY ACTIVITY AGAINST HUMAN MELANOMA ANTIGENS. *(E.)* Vanwijck, R. (Dep. Plast. Surg., Univ. Liege, Belgium), M. C. Moor, S. Malek-Mansour and P. Rustin. *Br J Cancer* 30(2):181, 1974.

4620 ELECTROPHORETIC MOBILITY OF MACROPHAGE AS A PARAMETER OF CELL-MEDIATED IMMUNITY. *(E.)* Iwaguchi, T. (Cancer Inst., Tokyo, Japan) and Y. Sakurai. *Gann* 65(6):561-562, 1974.

4621 'NONSPECIFIC' BLOCKING OF HUMAN OVARIAN CARCINOMA-ASSOCIATED CELLULAR CYTOTOXICITY *IN VITRO*. *(E.)* Saksela, E. (Dep. Virol., Univ. Helsinki, Finland), K. Pentinen and S. Pyrhonen. *Scand J Immunol* 3(6):781-788, 1974.

4622 EARLY APPEARANCE OF A LYMPHOID ARMING FACTOR AND CYTOTOXIC LYMPH-NODE CELLS AFTER TUMOR INDUCTION. *(E.)* Pollack, S. (Univ. Washington Sch. Med., Seattle) and K. Nelson. *Int J Cancer* 14(4):522-529, 1974.

4623 *IN VITRO* MEASUREMENT OF CYTOTOXIC ANTIBODIES IN MOUSE-IMMUNE SERA AGAINST MOUSE ASCITES TUMOR CELLS. *(E.)* Eng, C. P. (Allegheny Gen. Hosp., Pittsburgh, Pa.), W. R. Tolbert, J. B. Harnaha and J. P. Concannon. *Can J Microbiol* 20(12):1681-1688, 1974.

4624 CYTOTOXICITY OF HUMAN OSTEOSARCOMA SERA TO HAMSTER SARCOMA CELLS. *(E.)* Pritchard, D. J. (Mayo Clin. Mayo Found., Rochester, Minn.), C. A. Reilly, Jr., M. P. Finkel and J. C. Ivins. *Cancer* 34(6):1935-1939, 1974.

4625 CELL MEDIATED CYTOTOXICITY AGAINST HUMAN TRANSITIONAL CELL CARCINOMAS OF THE GENITOURINARY TRACT. *(E.)* Hakala, T. R. (Univ. Minnesota, Sch. Med., Minneapolis), P. H. Lange, A. Castro, A. Elliott and E. E. Fraley. *Cancer* 34(6):1929-1934, 1974.

4626 CELL-MEDIATED ANTI-TUMOR IMMUNITY IN ONCORNAVIRUS-INDUCED TUMORS: SPECIFIC CYTOSTASIS OF TUMOR CELLS BY SPLEEN AND LYMPH-NODE CELLS. *(E.)* Senik, A. (Hosp. Cochin, Paris, France), L. de Giorgi and J. P. Levy. *Int J Cancer* 14(3):386-395, 1974.

4627 CELL-MEDIATED IMMUNITY TO PLASMA CELL MYELOMA: SPECIFIC INHIBITION BY A SERUM FACTOR ADHERING TO EFFECTOR LYMPHOCYTES. *(E.)* Mavligit, G. M. (M. D. Anderson Hosp. Tumor Inst., Houston, Tex.), J. U. Gutterman, E. M. Hersh and R. Alexanian. *Proc Soc Exp Biol Med* 147(2):537-540, 1974.

4628 SURFACE CHARGE AND AGGLUTINABILITY BY CONCANAVALIN A OF NORMAL AND MALIGNANT TRANSFORMED CELLS. *(E.)* Marikovsky, Y. (Weizmann Inst. Sci., Rehovot, Israel), M. Inbar, D. Danon and L. Sachs. *Isr J Med Sci* 10(12):1579-1580, 1974.

4629 SURFACE IgD IN IMMUNOPROLIFERATIVE DISORDERS. *(E.)* Preud'Homme, J. L. (Hosp. St. Louis, Paris, France), J. C. Brouet, J. P. Clauvel and M. Seligmann. *Scand J Immunol* 3(6):853-858, 1974.

4630 STUDY OF PEPSIN DIGESTION PRODUCTS OF DIMERIC FORMS OF HUMAN SERUM IgA. *(Fr.)* Rivat, C. (Hum. Protein Genet. Res. Group U 78, INSERM, Bois-Guillaume, France), J. Bourguignon, M. Fontaine and C. Ropartz. *C R Acad Sci* [*D*] *(Paris)* 279:1405-1407, 1974.

4631 EFFECT OF IMMUNOREGULATORY α-GLOBULIN ON *IN VITRO* PROLIFERATIVE RESPONSE OF IMMUNE RAT LYMPHOCYTES TO SYNGENEIC GROSS VIRUS-INDUCED LYMPHOMA. *(E.)* Glaser, M. (Natl. Cancer Inst., Bethesda, Md.) and R. B. Herberman. *J Natl Cancer Inst* 52/53(1/6):1767-1769, 1974.

4632 MONOCLONAL IgG-KAPPA CRYOIMMUNOGLOBULIN IN A WOMAN PATIENT WITH LYMPHORETICULAR SERIES HEMOBLASTOSIS. *(E.)* Tichy, M. (Fac. Med., Charles Univ., Hradec Kralove, Czechoslovakia), Z. Hrncir, M. Blaha and J. Vanasek. *Neoplasma* 21(6):717-721, 1974.

4633 SURFACE MARKERS ON HUMAN B AND T LYMPHOCYTES. *(E.)* Jøndal, M. (Dep. Tumor Biol., Karolinska Inst., Stockholm, Sweden). *Scand J Immunol* 3(6):748-755, 1974.

4634 LYMPHOCYTE SURFACE MARKERS IN ACUTE LYMPHOCYTIC LEUKEMIA. *(E.)* Davey, F. R. (Upstate Med. Cent., Syracuse, N.Y.) and A. J. Gottlieb. *Am J Clin Pathol* 62(6):818-822, 1974.

4635 IMMUNOFLUORESCENCE STUDIES ON THE SURFACE OF HUMAN LYMPHOCYTES IN CHRONIC LYMPHOCYTIC LEUKEMIA. *(E.)* Rozynkowa, D. (Acad. Med., Lublin, Poland) and D. Chibowski. *Arch Immunol Ther Exp (Warsz)* 22(5):601-606, 1974.

4636 NONSPECIFIC SUPPRESSION OF T LYMPHOCYTE RESPONSES IN MICE CARRYING PROGRESSIVELY GROWING TUMORS. *(E.)* Kilburn, D. G. (Dep. Zool., Univ. College London, England), J. B. Smith and R. M. Gorczynski. *Eur J Immunol* 4(12):784-788, 1974.

4637 INCREASE IN GROSS (G) ANTIGEN SITES ON THE SURFACE OF AKR VIRUS-INDUCED RAT LYMPHOMA CELLS AFTER TREATMENT WITH TRYPSIN. *(E.)* Brandchaft, P. B. (Natl. Cancer Inst., Bethesda, Md.) and C. W. Boone. *J Immunol* 113(1):94-102, 1974.

4638 INCREASE OF T LYMPHOCYTES IN THE SPLEEN IN HODGKIN'S DISEASE. *(E.)* Kaur, J. (R. Postgrad. Med. Sch., London, England), D. Catovsky, A. S. D. Spiers and D. A. G. Galton. *Lancet* 2(7884):800-802, 1974.

4639 BLOOD LYMPHOCYTES IN HODGKIN'S DISEASE: LYMPHOCYTOPENIA RELATED TO STAGES AND HISTOLOGICAL GROUPS. *(E.)* Heier, H. E. (Norwegian Radium Hosp., Oslo) and T. Normann. *Scand J Haematol* 13(3):199-202, 1974.

4640 DIFFERENCES IN THE REJECTION OF AN ALLOGENEIC TUMOR GRAFT IN TWO STRAINS OF INBRED MICE AND THEIR F_1 HYBRIDS. *(E.)* Turianskyj, F. H. (Fac. Med. Univ. Montreal, Canada) and L. Gyenes. *Immunol Commun* 3(6):565-575, 1974.

4641 MACROPHAGES ACTIVATION DURING GRAFT-VERSUS-HOST REACTION. *(E.)* Konikova, E. (Slovak Acad. Sci., Bratislava, Czechoslovakia). *Neoplasma* 21(6):645-653, 1974.

4642 RETICULUM CELL SARCOMA OF THE COLON FOLLOWING RENAL TRANSPLANTATION. *(E.)* Pinkus, G. S. (Peter Bent Brigham Hosp. Harvard Med. Sch., Boston, Mass.), R. E. Wilson and J. M. Corson. *Cancer* 34(6):2103-2108, 1974.

4643 IMMUNOELECTROPHORETIC FINDINGS IN MALIGNANT RETICULOSIS AND RETICULOGRANULOMATOSIS. *(Ger.)* Herrmann, W. P. (Dermatol. Clin., Univ. Cologne, West Germany) and H. Gartmann. *Z Hautkr* 49(15):661-666, 1974.

4644 RETICULUM CELL SARCOMA IN HERXHEIMER'S CHRONIC ATROPHIC ACRODERMATITIS. *(Ger.)* Geiger, H. G. (Dermatol. Clin., Univ. Freiburg/Breisgau, West Germany), M. Hagedorn and J. Petres. *Z Hautkr* 49(8):359-365, 1974.

See also:

* (Rev): 4214, 4216, 4221, 4222, 4223, 4226, 4244, 4245, 4246, 4247, 4748
* (Chem): 4269, 4292, 4296, 4298
* (Viral): 4405, 4408, 4412, 4414, 4416, 4417, 4429, 4441, 4467, 4486, 4487, 4490, 4491, 4496, 4503, 4514
* (Path): 4709, 4710

4645 HISTOLOGICAL VARIANTS OF PRIMARY INVASION IN BREAST CANCER. *(Rus.)* Gordeladze, A. S. (Med. Inst. Sanit. Hyg., Leningrad, USSR). *Vopr Onkol* 20(7):8-13, 1974.

Studies were conducted of 240 cases of breast cancer (24 cases of lobular and ductal carcinoma *in situ* and 270 invasive cancers). Histological and histochemical techniques revealed carcinoma *in situ* in 43.1% of the cases of invasive cancer. Three histological variants are described of carcinoma *in situ* undergoing transformation into invasive cancer: "budding" of the terminal portions with their malignant transformation and subsequent invasion of connective tissue or lymph vessels; progressive malignant transformation and proliferation accompanied by the formation of giant lobes and ducts which have lost their organoid nature; and invasive growth by individual cells.

4646 MICROENVIRONMENT AND INTERCELLULAR SPACE IN HUMAN BREAST TUMORS (ULTRASTRUCTURAL, HISTOCHEMICAL AND MORPHOLOGICAL STUDY). *(Fr.)* Noel, P. (Leon Berand Cent., Lyon, France), M. Faucon and B. Fontaniere. *Ann Anat Pathol (Paris)* 19(1):71-96, 1974.

Ruthenium red was used to stain the surface coat of cells in block biopsies from 35 human breast tumors (19 malignant and 16 benign) and in smears prepared from 25 human breast tumors (13 malignant and 12 benign). Satisfactory staining was obtained on only 15 (42.8%) of the block biopsies from 7 benign and 12 malignant tumors, while 19 of 25 smears (76%) from 7 benign and 12 malignant tumors were acceptably stained. Examination of all 34 stained tumors revealed that ruthenium red stained the apical pole of benign cells and the lateral aspects of tumor cells: this pattern, which was consistent throughout, appeared to be related to the benign or malignant nature of the tumor. Benign tumors were stained very homogeneously but not very deeply (75-268 Å), while the apical pole of malignant cells was irregularly stained, with one exception, to a depth of 600-1200 Å.
With the exception of fibroadenomas containing a great deal of connective tissue and tumors containing fibrocyte, collagen, or myoepithelial components, benign tumors contained large numbers of desmosomes. Microvilli, similar to those found in malignant tumors, proliferated in the fibroadenomas. Desmosomes were present in large numbers in differentiated carcinomas but were completely absent in undifferentiated carcinomas. Tight junctions were absent in malignant tumors, and the number of gap junctions appeared to decrease during malignant transformation. Tripartite junctions appeared to be absent in undifferentiated carcinomas but were present in some adenocarcinomas.

4647 INTRACEREBRAL BURKITT'S LYMPHOMA: PATHOLOGY, CLINICAL FEATURES AND TREATMENT. *(E.)* Magrath, I. T. (Lymphoma Treat. Cent., Makerere Univ., Kampala, Uganda), J. Mugerwa, I. Bailey, C. Olweny and Y. Kiryabwire. *Q J Med* 43(172):489-508, 1974.

Case histories are detailed describing clinical and pathological features of six patients in whom intracerebral Burkitt's lymphoma was diagnosed prior to death. The patients (aged 4-14 yr) were initially treated with cyclophosphamide as a single i.v. dose (40 mg/kg), repeated at two-week intervals for a varied number of doses. Postmortem examinations of the five patients who died showed that cerebral edema and perivascular cuffing by tumor cells were universal. Possible pathogenic mechanisms are: tumor cells may spread from meninges into neural tissue; they may reach the brain by way of the bloodstream; malignancy may develop *in situ*. The pathological findings were related to the clinical features in an attempt to establish a rational basis for diagnosis and treatment. Because of the rapid course of the disease, early diagnosis is imperative; raised intracranial pressure, characterized in part by persistent headache, and/or localizing neurologic signs are sufficient basis for commencing treatment. Although examination of cerebrospinal fluid may be helpful, malignant cells may not be present in the absence of meningeal infiltration. The treatment suggested is intrathecal drugs, cytosine arabinoside and methotrexate and a systemic lipid soluble agent, hydroxyurea. Dexamethasone should be routinely administered to reduce intracranial pressure.

4648 MORPHOLOGICAL FEATURES OF BRAIN TUMORS IN CHILDREN. *(Rus.)* Kantorovich, V. I. (Kharhov City Psychoneurol. Hosp., USSR). *Arkh Patol* 36(8):85-90, 1974.

A reveiw of 289 brain tumors in children and 1,887 in adults revealed a high prevalance of neuroectodermal neoplasms in children (75%); the prevalence of medulloblastoma (39.6%), astrocytoma (25.9%), and ependymoma (7.2%) were the highest. Of the mesenchymal neoplasms (3.4%), angioreticuloma and sarcoma accounted for 7.2% and 5.1%, resp. Craniopharyngiomas accounted for 11-13% of all brain tumors in children but only 1.2% in adults. A topographic analysis showed that in children neoplasms of the posterior cranial fossa were most common. Tumors of the cerebellum accounted for 55.3% of all cases; tumors of the brain stem accounted for 13.7% and those of the cerebral hemispheres for 13.5%.

4649 MALIGNANT TRANSFORMATION OF FIBROUS DYSPLASIA. *(Rus.)* Sadykhov, A. G. (Baku Sci. Res. Inst. Traumatol. Orthop., USSR), N. G. Abdullaev, F. Iu. Bairamov and A. M. Askerov. *Vestn. Khir.* 112 (3):130-131, 1974.

A study was conducted of 71 patients with fibrous dysplasia (FD); two patients had malignant transformation of FD. An 18-year-old girl was hospitalized with FD of the right humerus which was treated by curettage of the focus and plastic surgery. Four yr later the patient was readmitted to hospital with recurrent FD and malignant transformation. Extensive segmental resection of the humerus was performed with plastic surgery. A histological study confirmed the patient had malignant transformation of FD and polymorphocellular sarcoma.

4650 GRANULOPOIESIS IN CHRONIC MYELOID LEUKEMIA. I. *IN VITRO* CLONING OF BLOOD AND BONE MARROW CELLS IN AGAR CULTURE. *(E.)* Moberg, C. (Dep. Intern. Med., Univ. Lund, Sweden), T. Olofsson and I. Olsson. *Scand J Haematol* 12(5):381-390, 1974.

The *in vitro* colony-forming capacity of blood and bone marrow cells from 11 patients (six women and five men, aged 33-64 yr) with chronic myeloid leukemia (CML) was studied. The cells were grown in agar culture and plated on a feeder layer containing mixed leukocytes from peripheral blood of a normal donor. The number of colonies grown from the blood of CML patients was 1000-60,000 times greater than the number grown from normal cells. In CML the number of colonies formed from blood and bone marrow cells, resp., did not differ significantly when expressed per 2×10^5 cells. High WBC (> 60,000 cells/μl) correlated with high colony-forming values while, with a few exceptions, low colony-forming values were associated with low WBC. In some CML samples, a high degree of autostimulation resulted in colony formation in the absence of feeder layer cells. Such autostimulation might indicate increased production of colony-stimulating factor in CML. In the presence of a feeder layer, colony formation from normal bone marrow A cells was inhibited to the same extent by mature granulocytes (B cells) from healthy and leukemic donors. In addition, colony formation from CML cells was inhibited in 3 of 5 cases by the addition of either normal or CML B cells. In a few cases, B cells stimulated colony formation from both normal and leukemic cells. It is possible that a control mechanism of granulopoiesis involves feedback inhibition by substances produced by mature granulocytes.

4651 PRIMARY GRANULOCYTIC LEUKEMIA IN THE RAT. *(E.)* Moloney, W. C. (Peter Bent Brigham Hosp., Boston, Mass.). *Cancer Res* 34(11):3049-3057, 1974.

The incidence and clinical and laboratory features of granulocytic leukemia in the rat are described, and 2 new cases of this disorder in noninbred male Wistar rats are reported. These rats showed a greatly elevated WBC with a differential count typical of chronic granulocytic leukemia; nucleated red cells; polychromasia; infiltration of various organs with immature myeloid elements; positive myeloperoxidase reaction, leukocyte alkaline phosphatase and esterase activity; and green bone marrow. In 100 noninbred Wistar untreated rats that were followed throughout their life-spans, only three developed leukemias (two acute mononuclear cell leukemia and one granulocytic leukemia). When 437 untreated inbred W/Fu and Fischer rats were followed in a similar manner, no leukemias of the granulocytic variety occurred. Among 445 noninbred Wistar rats treated with total-body X-ray and/or methylcholanthracene (MCA), nine granulocytic leukemias developed, while only one granulocytic leukemia developed in a series of 1582 inbred W/Fu and Fischer rats treated with X-rays, MCA, or splenectomy. Thus granulocytic leukemia occurs spontaneously in very low incidence, especially among inbred rats. The clinical features of granulocytic leukemia were variable and are described. This disease, because it resembles granulocytic leukemia in man, may provide a test system for evaluation of chemotherapy and immunotherapy, and serve as an animal model for the disease in man.

4652 STRUCTURAL AND FUNCTIONAL HETEROGENEITY OF THE SURFACE OF RAT LEUKEMIA CELLS. *(E.)* Yip, D. K. (Cancer Res. Cent., Univ. British Columbia, Vancouver, Canada) and N. Auersperg. *J Cell Biol* 63:109-124, 1974.

The rat leukemic cell line IRC 741 was studied in an attempt to correlate specific functional characteristics of the cells with specific areas on their surface and to characterize these areas chemically and morphologically. IRC cells in suspension culture formed single cytoplasmic protrusions by which the cells preferentially adhered to one another. The induction and/or maintenance of these protrusions was sensitive to changes in intercellular contact, pH, temperature, and nutritional conditions. The protrusions were stable, rigid structures which took part in intercellular adhesion but not in adhesion to substrata. Movement on substrata occurred by means of ruffling membranes formed on the main cell body. This asymmetry in cellular form and function was associated with specialized cell surface regions. Ultrastructurally, the cell surface over the protrusions lacked microvilli and was covered with a 3,000-4,000 Å thick cell coat consisting of 200-500 Å electron-dense particles in an amorphous matrix. In contrast, the surface over the main cell body had microvilli and a 200-Å wide cell coat which lacked particles. The extracellular particles overlying the protrusions had electron-lucent cores, were protease- and pepsin-resistant, and did not stain with colloidal iron, while the matrix in which they were embedded was sensitive to proteolytic enzymes and contained acidic moieties. The negative surface charge density over the protrusions was higher than that over the main cell body, as shown by the orientation of the cells in an electric field. The observation that a region of higher charge density was one of increased intercellular adhesiveness was explainable in part by the rigidity of the protrusions and by the very small radius of curvature of the overlying extracellular particles. The protrusions permitted the observation of discrete regions, differing in charge density, on the surface of the living leukemia cells.

4653 STUDY ON THE FIBRILLAR FORMATION SURROUNDING THE NUCLEAR BRIDGE IN SOME TYPES OF LEUKAEMIC CELLS. *(E.)* Ito, S. (Niigata Univ. Sch. Med., Japan) and A. Hattori. *Scand J Haematol* 12(5):321-328, 1974.

Rieder's cells, which have a lobulated nucleus and a deep cleft, were studied by conventional and ultra-high-voltage electron microscopy in one case of acute myeloid leukemia (AML) and two cases of acute promyelocytic leukemia (APL). A few leukemic cells possessed two nuclei. The nuclear bridge of the Rieder's cells was tightly surrounded by a bundle of microfilaments that were generally sectioned longitudinally. The diameter of the individual microfilaments was 8-10 nm, while the thickness of the fibrillar formation was 0.6-0.9 μm. Mitochondria were observed around the fibrillar formation, which tended to be more abundant in APL than in AML. Analysis of thick sections under the ultrahigh-voltage electron microscope clearly demonstrated that the fibrillar formation circumscribed the nuclear constriction. The fibril bundle in this study is similar to the amphibian amitotic cell division observed by Pehlemann although a centriole origin for the microfilaments and cell division following amitotic nuclear division could not be confirmed. The present results suggest that Rieder's cells in certain luekemias may be produced by abortive amitosis caused by the contraction of microfilaments.

4654 MESOTHELIOMAS IN GOLDEN HAMSTER. IV. FURTHER STUDIES ON THE GROSS APPEARANCE AND HISTOLOGY, INCLUDING A LITERATURE SURVEY. *(Ger.)* Mehnert, W. H. (Cent. Inst. Cancer Res., Berlin-Buch, Germany), E. Bender, A. Graffi, T. Schramm and G. P. Wildner. *Arch Geschwulstforsch* 43(1):22-35, 1974.

Gross, histological, and electron microscopic findings in 139 spontaneous peritoneal mesotheliomas found in 6,596 golden hamsters are presented, along with a literature review on the histogenesis and etiology of these neoplasms. The peritoneal mesotheliomas found in golden hamsters showed typical growth behavior, such as formation of plates, callosities and nodes; involved abdominal organs; and were accompanied by abundant ascites. The volume of ascites fluid ranged from 1-2 to 75 ml/animal. The tumor tissue coating the peritoneal organs resembled "sugar frosting," with infiltration occurring very sparsely and only in advanced stages. The tumor never metastisized beyond the limits of the peritoneum. Small, whitish, nodular growths on the spleen, classified histologically as fibromas with low cell contents, were often found in animals of both sexes with peritoneal mesotheliomas. Papova virus-induced epithelial skin tumors were found in 97% of the hamsters with mesothelioma. Electron microscope detection of C-type virus particles in one transplantable mesothelioma line suggests that these tumors are viral in origin. These findings along with many in the literature indicate that mesotheliomas are tumors derived from the lining cells of the serous membranes, which must be considered differentiated cells of mesenchymal origin. The incidence of the mesotheliomas was highest in hamsters aged 9 to 14 months, with a maximum at age 12 months. No mesotheliomas occurred in animals less than 5 months old.

4655 THE RELATION BETWEEN CHRONIC PANCREATITIS AND CANCER OF THE PANCREAS. *(Rus.)* Mikhailichenko, V. A. (Donetsk Med. Inst., USSR), B. B. Bruk, N. M. Rovenskaia and M. A. Tamarkin. *Vopr Onkol* 20(9):57-61, 1974.

An analysis was made of 385 cases of cancer of the pancreas. Chronic pancreatitis preceded tumor growth in 30 patients (7.8%). In addition, 41.2% of histories revealed diseases which sometimes cause pancreatitis: 29 patients (7.5%) had peptic ulcers; 25 patients (6.5%), chronic hepatitis; 20 (5.2%), cholelithiasis; 39 (10.1%), chronic cholecystitis; and 46 (11.9%), chronic gastritis. A detailed histological study of 18 tumors and tissue outside the tumor revealed 14 scirrhous adenocarcinomas with areas of solid polymorphocellular carcinoma and two solid cancers, and two undifferentiated polymorphocellular carcinomas. Pancreatic tissue outside the tumor showed extensive interlobular and intralobular sclerosis, producing many small false lobes. The pancreatic stroma contained many focal infiltrates of mononuclear cells. Morphological changes (the rearrangement of acini, irregular hyperplasia with focal proliferation, poorly differentiated bile duct epithelium and atypia) are evidence that chronic pancreatitis often precedes cancer of the pancreas.

4656 SQUAMOUS CELL CARCINOMA OF THE PROSTATE AS AN EXAMPLE OF METAPLASIA IN A TUMOR. *(Ger.)* Kastendieck, H. (Inst. Pathol. Univ. Hamburg, Germany) and E. Altenahr. *Z. Krebsforsch* 82(4):335-340, 1974.

Metaplastic transformation of a prostate carcinoma into a squamous-cell carcinoma occurred in a 68-yr-old patient. After a typical, infiltrative prostate carcinoma with a partly glandular and partly solid and cribriform structure was removed, the remainder of the prostate was transformed into a keratinized squamous-cell carcinoma with small residual foci of regressively transformed adenocarcinoma. It invaded the pelvis, and osteolytic skeletal metastases were found 20 months after surgery. Most of the metaplastic carcinoma and the bone metastases were epidermoid in structure. Residual lumina of glandular acini, found sporadically within strands of the squamous cell carcinoma, suggested that the tumor was an adenoacanthoma, but this was ruled out since there was no evidence of secretion. It seems unlikely that estrogen therapy which the patient received was responsible for tumor metaplasia in this case.

4657 CLINICAL, HISTOLOGICAL AND HISTOCHEMICAL DIFFERENTIATION OF PRECANCEROUS CONDITIONS OF THE SKIN. *(Rus.)* Sheleshko, P. V. (Severo-Osetinskii Med. Inst., Ordzhonikidze, USSR). *Vestn Dermatol Venerol* (10):24-28, 1974.

Analyses of 1,270 case histories of skin cancer and precancer, and the examination of 255 patients with skin neoplasms made it possible to distinguish two groups of precancerous conditions: (1) obligate and (2) optional. To the former belong neoplasms and pathological developments exhibiting a marked degeneration of basal epidermis such as senile keratoma, cutaneous horn, dys- and hyperheratosis, papilloma and papillomatous lesions on parts of the body exposed to solar radiation. To the latter belong the above neoplasms without the signs of basal degeneration. The incidence of precancer developing into cancer in the region of Northern Osetia (Caucasus) was highest among the patients over 50 years old. Of the 355 cases of senile keratoma, 175 (49.3%) developed into cancer; of these, 91.5% were patients over 50. Of the 69 cases of cutaneous horn, malignant degeneration was observed in 30 (43.5%) patients, all over 50 years of age. Malignant degeneration of dys- and hyperkeratosis was recorded in 447 cases (46.3%) with the incidence in the 60-79 age group reaching 61.1%. Of 380 cases of papillomas, 108 (28.4%) developed into cancer mostly in the face and neck.

4658 SIPPLE SYNDROME: PHEOCHROMOCYTOMA AND MEDULLARY CARCINOMA OF THE THYROID (AMYLOID FORMATION). FAMILIAL FORM. *(Fr.)* Tcherdakoff, P. (Broussais Hosp., Paris, France), Y. Jiullet, C. Gaudart d'Allaines and J. P. Camilieri. *Ann Med Interne (Paris)* 125(11):855-862, 1974.

Case reports are presented for two patients with Sipple's syndrome. A 20-yr-old man who had undergone surgery for cancer of the thyroid medulla four yr previously presented with radiological evidence of a pheochromocytoma on the left adrenal and a probable tumor on the right adrenal. No recurrence of the thyroid tumor was detected, and at surgery no other tumors were found along the aortoiliac axis nor were there any hepatic metastases. After surgery, urinary catecholamine levels, which had previously been elevated, returned to normal. The second patient was a woman whose mother had died at age 47 of cancer of the thyroid medulla. This patient had a carcinoma of the thyroid medulla and bilateral pheochromocytomas. Histological examination of the thyroid tumor revealed that it was a very malignant epithelioma. Some of the cells were normal polyhedral or fusiform cells, while others were quite abnormal with several giant nuclei. No glandular or follicular tissue was found; the stroma was abundant and contained large, strongly acidophilic strands. Selective staining demonstrated that the stroma was amyloid in nature. The rest of the patient's family showed no evidence of Sipple's syndrome.

4659 CYTOCHEMICAL DETERMINATION OF PROTEIN SH-GROUPS IN NORMAL SQUAMOUS EPITHELIUM, CERVICAL EROSION AND SQUAMOUS CARCINOMA OF THE UTERINE CERVIX. *(Rus.)* Tolmachev, V. S. (Kazakh Inst. Oncol. Radiol., Alma-Ata, USSR). *Vopr Onkol* 20(8):17-21, 1974.

Smears were taken from five women with normal cervical mucosa, eight patients with cervical erosion and nine with squamous cell carcinoma of the cervix. Protein SH-groups were determined by the method of Barnell and Seligmann and by photometry of the nuclei and cytoplasm. The SH content in tumor cells was substantially higher than in cells from cervical erosions. Further studies showed that in erosions and cancer the epithelium had oversized cells with a very high SH content. Cells of this size were not detected in normal epithelium. In addition, in erosion and cancer, epithelial cells of normal size showed a significant increase in protein SH-groups. In the tumor cells, higher concentrations of SH-groups were observed in keratinized cancer cells. The nuclear-cytoplasmic ratio for the SH content increased from 0.14 in normal mucosa, to 0.93 in cervical erosions and 0.93 in squamous cell carcinoma. A direct positive correlation was established between the increased SH content of tumor cells and the size of the nucleus.

4660 AUTORADIOGRAPHIC SITE OF CELLS FIXED WITH CATECHOLAMINES FROM THE RAT AND FROM MAN. *(Fr.)* Uriel, J. (Cancer Res. Inst., Villejuif, France), D. Bouillon, C. Aussel and F. Loisillier. *C R Acad Sci [D] (Paris)* 279(7):575-577, 1974.

4661 QUANTAL CELL CYCLES, NORMAL CELL LINEAGES, AND TUMORIGENESIS. *(E.)* Holtzer, H. (Sch. Med., Univ. Pennsylvania, Philadelphia), S. Dientsman, S. Holtzer and J. Biehl. *Proc Fourth Int. Symp Princess Takamatsu Cancer Res Fund, Tokyo* pp. 389-398, 1973.

4662 MORPHOLOGY OF EXPERIMENTAL TUMORS OF THE NERVOUS SYSTEM IN RATS BEFORE AND AFTER CULTIVATION. *(Ger.)* Warzok, R. (No affiliation), R. Thust and E. M. Jackel. *Zentralbl Allg Pathol* 118(2/3):284, 1974.

4663 QUANTITATIVE INVESTIGATION OF THE EPIGENETIC VARIABILITY OF RHABDOMYOSARCOMA CELL ELEMENTS. *(Rus.)* Vakhtin, Iu. B. (Inst. Cytol., Leningrad, USSR) and I. N. Shvemberger. *Tsitologiia,* 15(2):201-210, 1973.

4664 TUMORS OF CURRENT INTEREST: HEMANGIOBLASTOMAS OF THE NEURAXIS. *(Fr.)* Resche, F. (Hosp. Univ. Cent., Nantes, France), G. Lefranc, G. Pradal, Y. Lajat, M. Collet and P. Descuns. *Rev Otonevrophtalnoe* 46(1):1-20, 1974.

4665 THE PATTERN OF DISTRIBUTION OF TUMOURS IN THE BRAIN AND SPINAL CORD. *(E.)* Iyengar, B. (Maulana Azad Med. Coll., New Delhi, India) and K. Chandra. *Indian J Cancer* 11(2):134-138, 1974.

4666 MENINGIOMAS OF THE LATERAL VENTRICLES: TWO CASES. *(Fr.)* Garre, H. (Univ. Hosp. Cent., Brest, France), G. Bedou, G. Besson and J. Y. Goas. *Ouest Med* 27(9):891-902, 1974.

4667 COMPARISON OF IMPRINT CYTOLOGICAL AND HISTOLOGICAL FINDINGS IN HUMAN SALIVARY GLAND TUMORS. *(Ger.)* Muller, H. A. (Pathol. Inst., Univ. Wurzburg, West Germany) and W. Bohm. *Verh Dtsch Ges Pathol* 58:504, 1974.

4668 AN ULTRASTRUCTURAL STUDY OF ADENOID CYSTIC CARCINOMA OF THE HUMAN SALIVARY GLAND. *(E.)* Panicker, K. N. S. (Cancer Res. Inst., Bombay, India), G. G. Potdar, and S. M. Sirsat. *Indian J Cancer* 11(2):168-176, 1974.

4669 MANDIBULAR LYMPHOSARCOMA: BURKITT'S TUMOR (?). *(Fr.)* Rosculescu, I. (Dep. Morphol., Fac. Med., Craiova, Rumania), I. Mihaescu, B. Zaharia, A. Bachner and I. Radu. *Rev Roum Morphol Embryol* 19(2):163-166, 1974.

4670 INFLAMMATORY PSEUDOTUMOURS OF THE LUNG. *(E.)* Strutynsky, N. (New York Med. Coll., N.Y.), E. J. Balthazar and R. M. Klein. *Br J Radiol* 47(554):94-96, 1974.

4671 BRONCHIAL CARCINOMA FROM A NONSURGICAL VIEWPOINT. *(Ger.)* Kaik, G. (Hanusch Hosp., Vienna, Austria), H. Harazim and B. Kaik. *Therapiewoche* 24(46):5398-5416, 1974.

4672 CASES OF PRIMARY TUMORS OF THE MEDIASTINUM AT THE MASSACHUSSETTS GENERAL HOSPITAL IN TEN YEAR PERIOD (1962-1972). *(E.)* D'Amico, D. F. (Massachusetts Gen. Hosp., Boston) and G. Favia. *Acta Chir Italica* 30(3):221-235, 1974.

4673 EARLY DIAGNOSIS OF PRECANCEROUS DISEASES AND OF CARCINOMA OF THE MAMMARY GLAND. *(Rus.)* Bruskin, Y. M. (Moscow, USSR). *Khirurgiya* (3):3-8, 1973.

674 RELATION BETWEEN MALIGNANT TRANSFORMATION OF POLYPOUS GASTRIC ADENOMAS AND THEIR ORMS AND DIMENSIONS. *(Rus.)* Lukinykh, A. K. (I. P. Pavlov Med. Inst., Ryazan, USSR). *Klin Med* 52(11): 58-62, 1974.

675 CASE OF A CARCINOID OF THE SMALL INTESTINE DISCOVERED THREE YEARS AFTER TREATMENT OF REAST CANCER. *(Fr.)* Verhaeghe, M. (Univ. Hosp. Cent., Lille, France), G. Depadt, M. Linquette, G. amaitre and A. Clay. *Lille Chir* 29(3):90-94, 1974.

676 GIANT PIGMENTED HAIRY NEVUS IN TWO SIBLINGS. *(E.)* Voigtlander, V. (Univ. Hautklinik, Heidelberg, West Germany) and E. G. Jung. *umangenetik* 24(1):79-84, 1974.

677 PROGRESSIVE SCLERODERMA OF THE SCROSCLEROSIS TYPE IN A MOTHER AND HER DAUGHTER WITH ULTIPLE SKIN TUMORS IN THE MOTHER. *(Ger.)* Meinhof, . (Dermatol. Clin., Univ. Erlangen, West Germany). *Haut Geschlectskr* 49(15):653-660, 1974.

678 PAPILLARY CYSTADENOMA OF THE EPIDIDYMIS WITH PSAMMOMA BODIES. *(E.)* Küchemann, K. (City Hosp., Leverkusen, West Germany). *Beitr Pathol* 53(4):406-409, 1974.

679 CARCINOMA *IN SITU* DURING PREGNANCY. *(Sp.)* Wachtel (Hammersmith Hosp., London, England). *Acta Ginecol* 25(6):483-492, 1974.

4680 PRECANCEROUS DERMATOSIS OF THE CERIVIX UTERI DURING PREGNANCY. *(Ger.)* Andrys, J. (Fac. Med., Karls-Univ., Hradec Kravlove, Czechoslovakia), K. Vacha, M. Rosol and J. Kopecny. *Zentralbl Gynäkol* 96(32):1012-1015, 1974.

4681 SIGNIFICANCE OF CHANGES IN VAGINAL CYTOLOGY ASSOCIATED WITH AN EPITHELIOMA OF THE UTERINE CERVIX. *(Sp.)* Garcia-Valdecasas Alba, R. (Fac. Med., Univ. Granada, Spain), L. Rodriguez Rico and V. Salvatierra Mateu. *Acta Ginecol* 25(4):345-359, 1974.

4682 UTERINE HEMANGIOPERICYTOMAS. *(Fr.)* Verhaeghe, M. (Oscar Lambret Res. Cent., Lille, France), A. Clay, G. Crepin, M. C. Fichelle, M. Ducrocq and A. Demaille. *Lille Med* 19(7):737-742, 1974.

4683 CLINICAL AND EVOLUTIONARY ASPECTS OF BLASTOMAS OF THE MULLERIAN DUCT. *(Fr.)* Clay, A. (Oscar Lambret Res. Center, Lille, France), M. Verhaeghe, M. C. Fichelle, J. Rochart and T. Mons. *Lille Med* 19(17):731-736, 1974.

4684 LIGHT AND ELECTRON MICROSCOPE FINDINGS ON THE INFILTRATIVE GROWTH OF PROSTATE CARCINOMA. *(Ger.)* Kastendieck, H. (Pathol. Inst., Univ. Hamburg, West Germany), E. Altenahr and P. Burchardt. *Verh Dtsch Ges Pathol* 57:463, 1973.

4685 MORPHOLOGY AND PROLIFERATION KINETICS OF VARIOUS DEVELOPMENTAL STAGES OF BLADDER TUMORS IN THE RAT. *(Ger.)* Kunze, E. (Pathol. Inst., Univ. Munich, West Germany), A. Schauer and S. Schatt. *Verh Dtsch Ges Pathol* 58:508, 1974.

4686 TUMOURS OF THE URINARY BLADDER. *(E.)* Kulkarni, S. V. (Lokmanya Tilak Munic. Med. Coll., Bombay, India) and P. M. Chaphekar. *Indian J Cancer* 11(2):151-161, 1974.

4687 THE EXTENT OF RECTAL PREMALIGNANT CHANGE IN ULCERATIVE COLITIS. *(E.)* Riddell, R. H. (St. Mark's Hosp., London, England). *Gut* 15(10): 822, 1974.

4688 A CLINICO-BIOCHEMICAL STUDY OF PHOSPHOHEXOSE-ISOMERASE, ALIESTERASE AND SULFHYDRYL GROUP, IN 25 NORMAL AND 35 CANCER SUSPECTS. *(E.)* Vaid, P. (RNT Med. Coll., Udaipur, India), D. C. Sharma, and K. D. Shastri. *Indian J Cancer* 11(4):448-456, 1974.

4689 TRANSITIONAL CELL CARCINOMA OF BLADDER -- A STUDY IN TUMOR RESPONSE/DOSE. *(E.)* Morrison, R. (Hammersmith Hosp., London, England). *Radiat Res* 59(1):91, 1974.

4690 'CARCINOMA THYROID'. *(E.)* Sachdeva, H. S. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India), J. D. Wig, and B. N. Dutta. *Indian J Cancer* 11(4):375-381, 1974.

4691 CAUSAL PATHOGENESIS AND MORPHOLOGY OF THYROID TUMORS IN THE RAT. *(Ger.)* Thomas, C. (Pathol. Inst., Univ. Freiburg, West Germany) and R. Bollmann. *Verh Dtsch Ges Pathol* 57:473, 1973.

4692 MIXED TUMOR OF THE CORTICAL LAYER OF THE ADRENAL GLANDS. *(Rus.)* Alekseyev, B. V. (Dep. Surg. Pediatr. Inst., Novosibirsk Med. Inst., USSR) and T. K. Shurayeva. *Khirurgiya* (3):112-113, 1973.

4693 NATURAL HISTORY OF CHRONIC GRANULOCYTIC LEUKEMIAS. *(Fr.)* Baserga, A. (Med. Clin., Univ. Ferrara, Italy). *Nouv Rev Fr Hematol* 14(5): 583-586, 1974.

4694 TWO-PHASE EVOLUTION OF A HYPOPHYSEAL ADENOMA: AMENORRHEAL-GALACTORRHEAL SYNDROME FOLLOWED BY CUSHING'S SYNDROME. *(Fr.)* Berthezene, F. (Antiquaille Hosp., Lyon, France), R. Mornex, M. Boucher, G. Fournier and B. Claustrat. *Rev Otoneuroophtalmol* 46(3):295-302, 1974.

4695 THYROTROPIC-CELL HYPOPHYSEAL ADENOMA. *(Fr.)* Guinet, P. (Clin. Endocrinol., Claude-Bernard Univ., Lyon, France). *Rev Otoneuroophatalmol* 46(3):253-264, 1974.

4696 HODGKIN'S DISEASE OF THE SPLENIC LYMPH NODES FOLLOWING A MALIGNANT CUTANEOUS RETICULOSIS. *(Fr.)* Belaich, M. S. (No affiliation), D. Bonvalet, L. Schnitzler and M. R. Degos. *Bull Soc Fr Dermatol Syphiligr* 81(4):401-403, 1974.

4697 MYELOMA IN A CASE OF HODGKIN'S DISEASE. *(E.)* Cawley, J. C. (Dep. Med., Univ. Cambridge, England), A. H. Goldstone, J. Arno, J. H. K. Rees and A. Grant. *Acta Haematol (Basel)* 52(6):349-355, 1974.

4698 HODGKIN'S DISEASE TERMINATING IN ACUTE MYELOID LEUKAEMIA. *(E.)* Mauri, C. (Inst. Pathol. Spec. Med., Univ. Modena, Italy) and D. Quaglino. *Haematologica (Pavia)* 59(1):86-90, 1974.

4699 *IN VIVO* KINETIC STUDIES IN HUMAN MYELOMA. *(E.)* Pileri, A. (Inst. Semeiat. Med., Univ. Torino, Italy) and R. P. Tarocco. *Haematologica (Pavia)* 59(1):10-24, 1974.

4700 BURKITT'S LYMPHOMA: REPORT OF CASE. *(E.)* Subbuswamy, S. G. (Grant Med. Coll., Bombay, India), G. G. Menon and V. Talwalker. *Indian J Cancer* 11(3):349-354, 1974.

4701 ULTRASTRUCTURAL STUDY OF LYMPHOMATOID PAPULOSIS. *(Fr.)* Fondimare, A. (No affiliation), F. Thorel and G. Audebert. *Ann Dermatol Syphiligr (Paris)* 81(2):146-148, 1974.

4702 PRIMARY MELANOMA OF THE LEPTOMENINGES. *(E.)* Pal, A. K. (Command Pathol. Lab., Lucknow, India), S. K. Chopra and H. K. Samanta. *Indian J Pathol Bacteriol* 17(3):187-189, 1974.

4703 OSSIFYING LIPOMA. *(E.)* Murphy, N. B. (Reg. Hosp., Galway, Ireland). *Br J Radiol* 47(554):97-98, 1974.

4704 DERMATO FIBROSARCOMA PROTUBERANS. REPORT OF FOUR CASES WITH REVIEW OF LITERATURE. *(E.)* Talib, V. H. (Med. Coll., Aurangabad, India), Z. Sultana, S. D. Patil and K. D. Sharma. *Indian J Cancer* 11(2):200-208, 1974.

4705 ERYTHRODIFFERENTIATION OF CULTURED FRIENT LEUKEMIA CELLS. *(E.)* Ikawa, Y. (Cancer Inst., Tokyo, Japan), J. Ross, P. Leder, J. Gielen, S. Packman, P. Ebert, K. Hayashi and H. Sugano. *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* pp. 515-546, 1973.

4706 ARCHITECTURE OF LEYDIG'S TRANSITIONAL CELLS IN THE RAT AND THEIR ULTRASTRUCTURE AFTER ADMINISTRATION OF ANDROGEN ANTAGONISTS. *(Ger.)* Bonk, U. (Munic. Hosp., Karlsruhe, West Germany), W. Gusek and G. Zendt. *Verh Dtsch Ges Pathol* 57:474, 1973.

4707 HISTOLOGICAL AND ELECTRON MICROSCOPE FINDINGS IN A TUMORIGENIC AMYLOIDOSIS. *(Ger.)* Richter, K. (Prov. Hosp., Hannover, West Germany) and H. J. Lobich. *Verh Dtsch Ges Pathol* 57:417, 1973.

4708 BENIGN METASTASIS OF NEVUS CELLS. *(E.)* Bhargava, M. K. (Bangalore Med. Coll., India). *Indian J Cancer* 11(4):399-403, 1974.

4709 VARIANTS OF YOSHIDA ASCITES SARCOMA AND α-FETOPROTEIN. *(E.)* Isaka, H. (Sasaki Inst., Tokyo, Japan), H. Satoh and H. Hirai. *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* pp 311-323, 1973.

4710 MORPHOLOGICAL FINDINGS WHICH EXPLAIN WHY HUMAN CANCER CELLS ARE POOR IMMUNOGENS. *(Ger.)* Dallenbach, F. D. (German Cancer Res. Cent., Heidelberg) and R. Bauz. *Verh Dtsch Ges Pathol* 58: 514, 1974.

4711 THE NUTRITIONAL PHYSIOLOGY OF FRYING OILS: 6. HISTOLOGICAL FINDINGS IN TWO GENERATIONS OF RATS WHICH HAD BEEN FED FRYING OILS FOR THEIR ENTIRE LIVES. *(Ger.)* Kracht, K. (Pathol. Inst., Univ. Gottingen, West Germany), K. Lang and J. Henschel. *Z Ernaehrungswiss* 13(3):132-142, 1974.

4712 DEVELOPMENT OF A CYTOPATHOGENIC AGENT FROM THE EUROPEAN CATFISH *(SILURUS GLANIS)* WITH SKIN NEOPLASMS IN SINGLE-CELL GONAD CULTURES. *(Rus.)* Zubkova, L. A. (Caspian Sci. Res. Inst. Fish. Aktrakhan, USSR). *Dokl Akad Nauk SSSR* 218(3):960-962, 1974.

See also:

* (Rev): 4224, 4225, 4249, 4250, 4251, 4252, 4253, 4254, 4255, 4256, 4257, 4258, 4259, 4260
* (Chem): 4344
* (Viral): 4418, 4496
* (Immun): 4539, 4543, 4644
* (Epid-Biom): 4730

4713 APPARENT CHANGES IN CANCER MORTALITY, 1968: A STUDY OF THE EFFECTS OF THE INTRODUCTION OF THE EIGHTH REVISION INTERNATIONAL CLASSIFICATION OF DISEASES. *(E.)* Percy, C. (Natl. Cancer Inst., Bethesda, Md.), L. Garfinkel, D. E. Krueger, and A. B. Dolman. *Public Health Rep* 89(5):418-428, 1974.

Analysis of U.S. cancer mortality figures showed a 10% increase in deaths from cancer of lung and bronchus between 1967, when the seventh revision of the International Classification of Diseases was used, and 1968, when the eighth revision was first used. As a result, a project was conducted to examine the impact of the eighth revision on cancer mortality statistics and to code a sample of death certificates by the codes and rules of both revisions. A sample of 2752 death certificates was drawn from the American Cancer Society's Cancer Prevention Study; it represented 25% of death certificates for cancer patients dying from 1966-1971 in ten states. The sample was augmented by an additional 150 death certificates that mentioned lung cancer. In general, the results for most sites agreed with the data reported in the U.S. The sample showed a 2.4% increase in deaths coded to lung cancer, a 50% decrease in secondary cancer of the thoracic organs, and a 17.2% decline in cancer of other and unspecified organs. Of the 18 cases in this sample that were coded as secondary cancer of the thoracic organs by the seventh revision rules, 12 (67%) were coded as primary lung cancer by the eighth revision rules. This would produce an overall increase in primary lung cases when applied to the total U.S. deaths. Of the four cases coded to secondary lung cancer by the eighth revision, one was coded as skin cancer and three as cancer of other and unspecified sites by the seventh revision. Of the 99 deaths coded to the latter category by the seventh revision, only 82 were coded to an equivalent category by the eighth revision. Two cases were coded to primary lung cancer. This study demonstrates that changes in coding procedures can have a noticeable effect on the number of deaths assigned to individual categories, even though they may have little effect on overall cause-of-death statistics. Thus, in a long-range study it might be advisable to use the same coding rules even if the international rules change in the interim.

4714 SUPERFICIAL CANCER IN THE SUDAN. A STUDY OF 1225 PRIMARY MALIGNANT SUPERFICIAL TUMOURS. *(E.)* Malik, M. O. A. (Fac. Med. Univ. Khartoum, Sudan), A. Hidyatalla, E. H. Daoud and A. M. El Hassan. *Br J Cancer* 30(4):355-364, 1974.

A total of 60,940 surgical biopsies from two laboratories in Sudan during the period 1962-1972 were examined for cases of superficial cancer. There were 1225 superficial cancers consisting of squamous cell carcinoma (776 cases); basal cell carcinoma (182 cases); malignant melanomata (231 cases); and Kaposi's sarcoma (36 cases). The sites of the superficial cancers represented the skin proper as well as the penis, vulva, scrotum, anal canal and eyes. All the tumors were verified histologically. Generally, twice as many cases occurred in males as in females, with the exception of Kaposi's sarcoma where all the patients were males. Although a relatively high proportion of cases occurred in the young age groups, the age-specific incidence was noted to increase with age. Similarities and differences in the anatomical site of tumors compared with European and African series were noted. Certain differences emerged in the geographical distribution of these tumors in the Northern and Southern regions of the Sudan--regions which differ both ethnologically and geographically--thus suggesting possible roles played by racial and environmental factors in this respect. In general, the pattern in the Southern Sudan seems to approximate more to that of the neighboring African countries than to that of the Northern Sudan. The pattern in the Northern Sudan seems to be a mixture of the situation as it occurs in Caucasians and Negroids.

4715 ABSENCE OF LYMPHOMAS IN CBA MICE DERIVED BY EMBRYO TRANSFER AND BORN FROM LYMPHOMA-PRONE AKR MICE. *(E.)* Barnes, R. D. (Clin. Res. Cent., Middlesex, England) and M. Tuffrey. *Eur J Cancer* 10(9):575-578, 1974.

Vertical transmission of the oncogenic virus associated with lymphoma at and beyond the stage of implantation and resultant tumor susceptibility were investigated in mice using the technique of early embryo transfer. One hundred eighty-four CBA embryos (lymphoma-resistant) were obtained and transplanted at the early blastocyst stage into pseudopregnant AKR recipients (lymphoma-prone); 63 progeny survived and were milk fostered upon the same AKR recipients. The embryo transplanted CBA were examined clinically at weekly intervals along with control groups of AKR and CBA. In the controls, 156/163 AKR showed incidence of lymphoma between the ages of 16-56 weeks, and tumors were occasionally observed in the 73 CBA controls, but they were generally hepatomas. There was no evidence of lymphomas in any of the embryo-transplanted CBA mice. The results suggest that neither the transplacental nor the transmammary route is of significance in determining lymphoma susceptibility, but an unidentified, genetically determined, dominant factor must be present in the CBA that enables it to overcome the oncogenic susceptibility.

4716 CARCINOMA OF THE ESOPHAGUS IN THE MIDDLE EAST. *(E.)* Razek, M. S. A. (Am. Univ. Hosp., Beirut, Lebanon) and V. H. Nassar. *J Med Liban* 27(2):149-158, 1974.

Carcinoma of the esophagus has been recognized as having particular geographic distributions; this implies environmental factors in the etiology of the disease. A total of 148 cases of tumors of the esophagus seen at the American University in Beirut, Lebanon, over the period 1939-1970 were reviewed. The purpose of the study was to determine whether a geographical variation is displayed by cases of squamous cell carcinomas; to verify any biological differences in the type and histology of carcinoma in patients from the Arabian peninsula; and to analyze the management of carcinoma of the esophagus at American University Hospital. Of the 148 cases, 53.4% came from the Arabian Peninsula and 44.5% from the Near East. Squamous cell carcinoma was confirmed in 86 patients of whom 62% were from the Arabian Peninsula and 32% from the Near East. In contrast, 18% of 31 cases of adenocarcima were from the Arabian Peninsula and 80% from the Near East. The reasons for the higher prevalence of squamous cell carcinoma in the Arabian Peninsula should be further investigated by epidemiologic surveys. No differences in the biology or histology of squamous cell carcinoma were noted between the two groups studied. Operative mortality was 13% in the 31 operated squamous cell carcinoma cases. Eight patients with adenocarcinoma underwent exploration alone, 13 exploration + tumor resection, and 5 exploration + palliative procedure. Operative mortality was 23%.

4717 CANCER OF THE NASOPHARYNX. INCIDENCE, CLINICAL COURSE AND RESULTS OF THERAPY: A REPORT FROM GREECE.

(E.) Papavasiliou, C. G. (Univ. Athens Med. Sch., Greece). *Clin Radiol* 25(3):409-414, 1974.

A series of 149 cases of cancer of the nasopharynx treated in Greece is reported. The patients included 93 men and 56 women with a mean age of 48.2 yr (range 8-76 yr). Histologically, the tumors were lymphoepithelioma (55 patients), squamous cell carcinoma (34), anaplastic carcinoma (34), sarcoma (22), and adenocarcinoma (2); in two cases no biopsy report was available. The most common symptom was hearing disturbance (105 patients) followed by cervical lymphadenopathy (99). Nodes were occasionally visualized by ^{67}Ga scintigraphy. All patients were treated by supervoltage irradiation (cobalt teletherapy at < 6000 to > 7000 rads). The five-yr survival was 25.7% (27 of 105 patients at risk) and the ten-yr survival was 16% (8 of 53). Treatment failures were due to distant spread, inadequate dosage, and possibly an incorrectly defined tumor volume. Among 21 patients with local recurrence in the nasopharynx and/or in the lymph nodes of the neck, three are alive after a second course of radical radiotherapy. None of 11 patients with recurrent tumor in the base of the skull and none of 12 with bone metastases are alive. Palliation in these cases was of short duration. The only late side effect encountered in this series was fibrosis of the temporo-mandibular joint (17 cases).

4718 HIGH INCIDENCE OF LARYNGEAL CANCER IN THE PROVINCE OF TORINO (ITALY).

(It.) Terracini, B. (Inst. Anat. Pathol., Univ. Torino, Italy), E. Anglesio, P. M. Cappa, S. Coverlizza, M. Panero and G. Pastore. *Tumori* 60(2):143-156, 1974.

The high incidence of laryngeal cancer in the province of Torino, Italy, was examined. A total of 875 cases occurring in residents of the province were available from the Cancer Registry of Piedmont between 1965-1969. A histological report was available in 67.9% of the cases, while in 21.8% the death certificate was the only document with diagnosis of laryngeal cancer. Cases were uniformly distributed throughout the 5 yr of the study. The province of Torino was divided into three areas: the city of Torino (pop. 1,107,919); the 23 suburbs (pop. 340,951); and the nonmetropolitan part of the province (pop. 626,023). Among the three areas, the relative frequency of laryngeal cancer/all malignant tumors recorded at the Registry in males was 5.78% in the city of Torino, 6.43% in the suburbs, and 4.77% in the nonmetropolitan area. The difference between the city and the suburbs was not statistically significant, while the differences between the city of Torino and the nonmetropolitan part of the province and between the suburbs and the nonmetropolitan areas were significant ($p < 0.05$ and $p \sim 0.01$, resp.) In the province as a whole, age standardized annual incidence/100,000 of laryngeal cancer was 12.6 in men and 0.6 in women. In men these rates are approximately 5-7 times higher than those recorded in Norway, Sweden and Denmark, and about 3.5-6.0 times higher than those recorded in six cancer registries in Great Britain. A comparison between the province of Torino and other cancer registries on age-specific incidences showed that the ratio of the province of Torino/other registries is relatively higher at age 35-44 than later in life. This is considered to be evidence of an increase of the environmental carcinogenic load in the province of Torino during recent years. In both the city of Torino and the suburbs, aged-standardized incidences and incidences trunctated to ages 35-64 were 1.5-1.7 times higher than in the nonmetropolitan district; the difference involved mainly age groups over 55. However, the incidence of laryngeal cancer truncated to ages 34-64 in the nonmetropolitan part of the province was still 7.2 times higher than the rural population of Norway and 2.1-4.1 times higher than in the six British cancer registries. This suggests that factors such as air pollution are a minor cause of the excess laryngeal cancer in the province of Torino.

4719 THE EFFECT OF MIGRATION ON THE RISK OF NASOPHARYNGEAL CANCER AMONG CHINESE.

(E.) Buell, P. (California State Dep. Health, Berkely). *Cancer Res* 34(5):1189-1191, 1974.

The order of magnitude for the incidence of nasopharyngeal cancer among the Chinese in California is roughly equal to the very high rate in Southeast Asia. An age standardized survey from the San Francisco area for nasopharyngeal cancer indicated the incidence to be 17.8/100,000 Chinese males as opposed to 0.9/100,000 white males. The incidence of nasopharyngeal cancer among first, second, and third generation Chinese in California was studied in order to explain the etiology of this disease. Data from death certificates of nasopharyngeal cases between 1949-1972 showed a gradient of lower risk of the disease in the second and third generations. However, the third generation was still left with a 10-fold greater risk than Caucasians. It was concluded that the etiology of nasopharyngeal cancer is multifactorial, involving an environmental agent that interacts with genetic factors. The agent seems to be more common in Southeast Asia, perhaps associated with cultural practices which are carried out by those persons who migrated to California.

4720 THE INCIDENCE OF MALIGNANT TUMOURS IN PATIENTS WITH RESPIRATORY SARCOIDOSIS.

(E.) Brincker, H. (Odense Hosp., Copenhagen, Denmark) and E. Wilbek. *Br J Cancer* 29(3):247-251, 1974.

The possibility of increased incidence of cancer was investigated in 2561 respiratory sarcoidosis patients reported between 1962 and 1971 in Denmark. Of these, 17 were excluded because cancer had been diagnosed previously to the sarcoidosis. Of the remaining 2544, 48 had cancer diagnosed simultaneously with or after the sarcoidosis. None of the 48 had more than one malignant disease. To calculate the expected number of cancer cases, the sarcoidosis patients were broken down by yr of report, each group was split by sex and age, and the sex and age specific incidence of cancer in the Danish general population was applied to each cell. It was calculated that 33.8 cases were expected, as opposed to the 48 observed, a statistically significant difference. The higher incidence was largely due to nine observed cases of lung cancer, in contrast to the expected 2.8 cases. In addition, six cases of malignant lymphoma were observed, while only 0.5 were expected. Both differences were highly significant. Excess morbidity existed only in the first four yr after diagnosis of sarcoidosis; 38 cases of cancer being observed, while 21.2 cases were expected; a highly significant difference. It is concluded that respiratory sarcoidosis has a positive correlation with lung cancer and malignant lymphoma.

4721 SMOKING AND MORTALITY AMONG U.S. VETERANS. *(E.)* Rogot, E. (Natl. Heart Lung Inst., Bethesda, Md.). *J Chronic Dis* 27(4/5):189-203, 1974.

The general mortality experience of 293,958 U. S. veterans as related to tobacco usage by the cohort approach was reported after a 16 yr period. Cigarette smokers had the highest mortality level, followed by cigar smokers and pipe smokers. The age-adjusted probabilities of death in 16 yr for those smoking one form of tobacco only were 0.457 for cigarettes, 0.342 for cigars, 0.316 for pipes, and 0.294 for those who never smoked. Probabilities for those smoking more than one form of tobacco were intermediate to those of the separate forms. Ex-cigarette smokers, who had stopped for reasons other than doctor's orders, had risks between the current cigarette smokers and nonsmokers with the mortality level depending upon length of time discontinued. Many groups of former cigarette smokers demonstrated annual risks at or close to the non-smoker levels by the end of the study periods; for others, some excess risk remained at the end of the study period.

4722 BLADDER CANCER MORTALITY IN ENGLAND AND WALES IN RELATION TO CIGARETTE SMOKING AND SACCHARIN CONSUMPTION. *(E.)* Armstrong, B. (Radcliffe Infirm., Oxford, England) and R. Doll. *Br J Prev Soc Med* 28(4):233-240, 1974.

Cohort analyses of bladder cancer mortality in men and women in England and Wales were compared with figures for the per capita consumption of saccharin and cigarette tobacco and with similar analyses of cigarette smoking habits. That increases in bladder cancer mortality in men are due to cigarette smoking is supported by the correspondence between the first male cohorts to show a sharp increase in mortality (those born around 1865-1875) and the beginning of significant cigarette smoking by men (1890, when these cohorts had a mean age of 15-25 yr); and by the correspondence between the male cohort with peak bladder cancer mortality (that born around 1900) and that with the maximum percentage of cigarette smokers. In women, there are no clear increases in bladder cancer mortality corresponding to the mass increase in cigarette consumption starting in 1920. Trends in bladder cancer mortality in men and women show no evidence of any break in continuity that could be attributed to the use of saccharin since 1939. However, it may be to early to see an effect of saccharin consumption on mortality rates.

4723 STEM CELL KINETICS IN THE L 5222 RAT LEUKAEMIA. *(E.)* Hoelzer, D. (Clin. Res. Cent., Univ. Ulm, Germany), E. B. Harriss and C. Jäger. *Cell Tissue Kinet* 7(6):567-576, 1974.

The behavior of normal hemopoietic bone marrow stem cells during the development of the acute transferable rat leukemia, L 5222, was studied using inbred BD IX rats of both sexes. The animals were injected with 10^7 leukemia cells, after which the production of red cells and the granulopoietic committed stem cells in the bone marrow were measured. In addition, femoral bone marrow smears from leukemic rats which had been injected pre- and post-natally with ^{3}H-thymidine were examined autoradiographically. The granulopoietic committed stem cells, measured by the *in vitro* colony technique, showed a marked decrease to less than half normal levels. Pluripotent stem cells included in the small lymphocytes of the bone marrow showed only a modest decrease in number and an unchanged labeling intensity. There was also a marked decrease in erythropoiesis as the disease progressed. The results suggest that in this leukemia, the pluripotent stem cells may be affected in such a way that they are unable to react by proliferation to the depletion of the succeeding cell compartments. This might be due to inhibition by leukemic cells or to a disturbed feedback regulation between the committed and pluripotent stem cell compartments.

4724 GROWTH OF HUMAN LEUKAEMIC PERIPHERAL BLOOD CELLS IN DIFFUSION CHAMBERS. *(E.)* Hoelzer, D. (Clin. Res. Cent., Univ. Ulm, Germany), E. Kurrle, U. Ertl and A. Milewski. *Eur J Cancer* 10(9):579-589, 1974.

The growth of peripheral blood leukocytes from ten patients with varying forms of acute leukemia was investigated (using a diffusion chamber) and compared to cells from four normal persons. Erythrocytes and granulocytes were removed using the Isopaque-Ficoll method, and the resulting mononuclear cell suspension was cultured up to three weeks in diffusion chambers implanted into preirradiated CBA mice. In the leukemic patients, the growth patterns differed widely from normal and also between the patients themselves. Five patients had an almost continuous cell increase exceeding normal, largely due to leukemic blast cells and granulopoietic cells, whereas other patients had growth curves similar to normal or a continuous decrease in cell number over the whole period. The extent of cell growth might be related to the diagnosis, since patients with marked increase in cell number had acute myeloid leukemia or acute erythroleukemia, whereas patients with practically no growth at all had acute undifferentiated leukemia or acute lymphoid leukemia. In some patients the number of granulopoietic cells in diffusion chambers greatly exceeded the corresponding number from normal cells, and it is assumed that some maturation of leukemic blast cells took place. From the high number of leukemic blast cells which developed in diffusion chambers in spite of a low ^{3}H-thymidine index in peripheral blood, it is concluded that either a small population of blast cells was capable of continued self-replication or that some non-proliferating quiescent leukemic cells re-entered proliferation.

4725 EPIDEMIOLOGICAL AND SOCIOLOGICAL PROBLEMS IN THE FUTURE CONTROL OF NEOPLASMS. *(Ger.)* Berndt, H. (Res. Group Neoplastic Dis., Berlin-Buch, Germany). *Z Aerztl Fortbild (Jena)* 68(19):1045-1048, 1974.

4726 THIRD NATIONAL CANCER SURVEY - AN OVERVIEW OF AVAILABLE INFORMATION. *(E.)* Cutler, S. J. (Natl. Cancer Inst., Bethesda, Md.), J. Scotto, S. S. Devesa and R. R. Connelly. *J Natl Cancer Inst* 53(6):1565-1575, 1974.

4727 VIEWPOINTS AND CRITERIA FOR THE RECOGNITION OF SOME CANCERS AS OCCUPATIONAL DISEASES. *(Ger.)* Konetzke, G. W. (Cent. Inst. Occup. Med., Berlin, Germany). *Arch Geschwulstforsch* 44(1):23-24, 1974.

4728 GEOGRAPHIC PATHOLOGY OF BURKITT LYMPHOMA ON THE IVORY COAST. *(E.)* Loubiere, R. (Fac. Med., Univ. Abidjan, Ivory Coast). *Medicina (B Aires)* 34 [Suppl. 1]:32, 1974/

4729 PREVALENCE OF ORAL MALIGNANT AND PREMALIGNANT LESIONS AMONGST TEXTILE MILL WORKERS OF AHMEDABAD - INDIA - A PRELIMINARY REPORT. *(E.)* Mani, N. J. (Oral Cancer Res. Proj. Gov. Dent. Coll. Hosp., Ahmedabad, India), K. Bhargava and A. M. Malawalla. *Indian J Cancer* 11(3):262-271, 1974.

4730 PREVALENCE OF ORAL LEUKOPLAKIA AND NICOTINE STOMATITIES IN SMOKERS A CLINICAL STUDY IN TEXTILE MILL WORKERS. *(E.)* Dayal, P. K. (Gov. Dent. Coll. Hosp., Ahmedabad, India), N. J. Mani, K. Bhargava and A. M. Malawalla. *Indian J Cancer* 11(3):272-279, 1974.

4731 STATISTICAL AND ETIOLOGICAL ASPECTS OF CARCINOMA OF THE LARGE INTESTINE. *(E.)* Parkash, O. (Wilhelminen Hosp., Vienna, Austria). *Digestion* 11(1/2):115-127, 1974.

4732 THE ROLE OF CERVICAL CYTOLOGY IN THE DECLINING MORBIDITY AND MORTALITY OF CERVICAL CANCER. *(E.)* Cramer, D. W. (Natl. Cancer Inst., Bethesda, Md.). *Cancer* 34(6):2018-2027, 1974.

4733 THE INCIDENCE AND MORPHOLOGICAL FEATURES OF PROSTATE CANCER AS A FUNCTION OF AGE. *(Rus.)* Bialik, V. V. (Kiev Sci. Res. Inst. Roentgenoradiol. Oncol., USSR). *Klin Khir* (10):64-66, 1974.

4734 REGISTRY FOR PROSTATE CARCINOMA. *(Ger.)* Dhom, G. (Pathol. Inst., Univ. Saarland, Homburg/Saar, West Germany). *Umschau Wissench Technik* 74(17):550-551, 1974.

4735 RURAL PREPONDERANCE OF TESTICUALR NEOPLASMS. *(E.)* Talerman, A. (Inst. Radiother., Rotterdam, Netherlands), J. G. A. H. Kaalen and W. Fokkens. *Br J Cancer* 29(2):176-178, 1974.

4736 STUDY OF THE PARTIAL SYNCHRONIZATION OF CELLS IN EXPERIMENTAL LEUKEMIA L 5222 IN RATS. *(Ger.)* Barlogie, B. (Med. Clin., Univ. Munster, West Germany), A. Rossner, U. Asseburg, D. Kamanabroo, W. Hiddemann and T. Buchner. *Verh Dtsch Ges Inn Med* 80:1670-1674, 1974.

4737 KINETIC FEATURES OF ERYTHROCYTE POPULATIONS FROM VARIOUS SEGMENTS OF THE INTESTINAL TRACT AS A FACTOR ACCOUNTING FOR THE DEVELOPMENT OF TUMORS. *(Rus.)* Pozharisskii, K. M. (N. N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR), V. F. Klimashevskii and V. A. Gushchin. *Dokl Akad Nauk SSSR* 220(1):216-219, 1974.

4738 AUTORADIOGRAPHIC STUDY OF THE RELATION BETWEEN TUMOR GROWTH AND ENDOTHELIAL PROLIFERATION. *(It.)* de Angelis, E. (Inst. Tumor Res. Treat., Naples, Italy), G. G. Giordano and A. Narici. *Tumori* 60(3):257-259, 1974.

See also:

* (Rev): 4205, 4227
* (Viral): 4412, 4497
* (Path): 4672, 4685, 4705

4739 DIFFUSION CHAMBER CULTURE OF HAMSTER MELANOMA CELLS *IN VIVO:* CULTURE CHARACTERISTICS IN ISO- AND HETEROLOGOUS HOST ANIMALS.

(E.) Schieferstein, G. (Max-Planck-Inst. Virus Res., Tubingen, Germany) and O. D. Laerum. *Arch Derm Forsch* 249(2):131-140, 1974.

Malignant hamster melanoma cells (Fortner M Mel 1 Hamster melanoma) were cultured in i.p. diffusion chambers in isologous (female Syrian golden hamsters) and heterologous (female Balb/c mice and inbred BD IX and Marshall rats) host animals. Four hr after implantation, the cells began to proliferate rapidly, reaching a maximum cell number per chamber after 3-8 days. The maximum cell density was highest in the hamster and mouse and a factor of two lower in the rat. The population doubling time was shortest in the hamsters and mice and somewhat longer in the rats. When the chamber capacity was reached, there was a high rate of cell death which outweighed the rate of cell proliferation in all chambers. In the hamsters, cell proliferation was observed even after four weeks of culture. Thus, hamster melanoma cells are capable of proliferation during diffusion chamber culture in hamsters, mice, and rats, but the type of host animal affects the proliferative characteristics of the cells. The diffusion chamber technique appears to provide a valuable alternative to other methods used for the culture of malignant melanoma cells *in vitro* and, in the form of transplanted ascites, *in vivo*.

4740 A SOURCE OF FAILURE IN SYNCHRONIZATION EXPERIMENTS USING MALIGNANT TUMORS *IN VIVO.*

(Ger.) Granzow, C. (Inst. Zellforsch., Deutshces Krebsforschungszentrum, Heidelberg, West Germany) and V. Granzow. *Z Krebsforsch* 81:15-22, 1974.

The possible cause of unsuccessful experiments on synchronization of mitoses in Ehrlich mouse ascites cell tumors by mitotic poisons was studied *in vivo*, using NMRI line male mice for i.p. transplantation and vincristine as a mitotic poison. It proved to be impossible to synchronize the ascites cell tumor, i.e., to completely inhibit cell mitosis. It was impossible to increase further the frequency of arrested mitoses, as achieved by means of a definite inhibitory dose of vincristine (2 μg per animal), by increasing the dose by 2 to 4 times. The impossibility of synchronization was shown to be due to inhomogeneity of the tumor cell population, involving variations in resistance to vincristine. Variations in resistance to vincristine imply inhibition of mitoses in vincristine-sensitive cells, while a small proportion of vincristine-resistant cells continues to proliferate to become predominant within a given cell population. Some of the cells proved to be able to store intranuclear PAS-positive deposits *in vivo*.

4741 CONVENTIONAL (FEULGEN) AND IMPULSE CYTOPHOTOMETRIC STUDIES OF TRANSPLANTABLE TUMORS.

(Ger.) Stohr, M. (German Cancer Res. Cent., Heidelberg), H. D. Gehrig and H. Lohrke. *Verh Dtsch Ges Pathol* 57:402, 1973.

The growth of Ehrlich's carcinoma, "cancer carcinoma" (Erlich subline), sarcoma 180 and Stockholm ascites tumor (SAT) in mice, as well as Walker's carcinoma, Yosh da sarcoma, and Zajdela hepatoma in rats was followed by conventional (Feulgen) and impulse cytophotometric studies in parallel tests. In almost all tumors investigated, the cell count increased rapidly after inoculation to reach a maximum, and to drop to about 50% of the peak value during the last third of the survival time. This resulted, in part, from increasing all clumping. While there was no correlation between the percentage of DNA-synthesizing cells and the growth of rat ascites tumors, a statistically significant correlation was found for all murine tumors except for sarcoma 180. The rate of synthesis dropped about 50% during tumor growth. The G2 cell count increased above the Gl cell count; this indicates a reduction in proliferative activity. Due to its high resolution power, impulse cytophotometry makes it possible to detect slight phase shifts occurring during tumor growth.

4742 CAPACITY FOR TUMOR CELL IMPLANTATION AS A FUNCTION OF *IN VITRO* CELL DENSITY.

(E.) Bosmann, H. B. (Univ. Rochester Sch. Med. Dent., N.Y.) and A. Lione. *Biochem Biophys Res Commun* 61(2):514-517, 1974.

The implantation properties of two melanoma cell lines, line 26 (low rate of implantation) and line 37 (high rate of implantation), were studied as a function of the cell density in monolayer cultures grown *in vitro*. Sparse cultures (collected at a density of 0.8×10^3 cell/cm^2) of line 37 produced 7.7 times as many lung tumor foci in C57 mice as did those of line 26. Confluent cultures (collected at a density of 40×10^3 cell/cm^2) produced a greater number of tumor foci, with line 37 producing only 3.1 times as many foci as line 26. Thus, the high implantation line has a much greater capacity to implant when grown in the sparse state and injected into living organisms than the low implantation line, but both lines have high implantation rates when injected as confluent cells.

4743 THE X-CHROMATIN AND THE CHROMOSOME NUMBER OF THE CELLS FROM HUMAN MALIGNANT MELANOMAS OF THE EYE.

(E.) Vrba, M. (Pediatr. Res. Inst., Brno, Czechoslovakia). *Neoplasma* 21(5):577-581, 1974.

Analysis of X-chromatin frequency in primary cell cultures of malignant melanomas of the uvea showed that frequency was in close accord with the phenotypical sex of patients. Frequency was 17-40% in 10 female melanoma cell cultures compared with >50% in normal diploid female cell cultures. No X-chromatin was found in male control fibroblast cultures and its frequency was never higher than 2% in the five male melanoma cell cultures. Karyotype determination in seven malignant cell cultures showed wide numerical variability of chromosomes (24-50); most of the karyotypes had the modal number 40. It is suggested that X-chromatin frequency and chromosome number in cultures derived from female melanomas depend on the heteronuclear or mixoploid properties of the cultures.

'44 HUMAN TUMOURS IN MICE CONFIRMED BY CHROMO-
SOMAL ANALYSIS. *(E.)* Bordelon, M. R.
I.D. Anderson Hosp. Tumor Inst., Houston, Tex.) and
Stubblefield. *Nature* 252(5481):324-325, 1974.

rradiated male BALBc/CRGL mice were inoculated
c. with 10^6 human cervical carcinoma cells. When
nodule was felt at the site of inoculation or
ter 21 days had passed, the minced tumor was re-
tablished in tissue culture. In animals allowed
survive, tumor regression *in vivo* started 28-30
ys after inoculation. When cultures were started
om tumors grown 12-21 days *in vivo*, the tumor
lls grew well *in vitro*. Prior to inoculation, the
rvical carcinoma cells had 63-70 chromosomes,
re than 40% having 66-68 chromosomes. After pas-
ge *in vivo* and reestablishment *in vitro*, 60-90% of
e cells had 66-68 chromosomes. The cells with
-68 chromosomes appeared to be able to grow with-
t restraint. Most cells contained representatives
each human chromosome and no mouse chromosomes
re present. Several new arrangements were seen,
t there did not seem to be any particular chromo-
mes gained or lost. The three cultures examined
ter mouse passage did not show a marked difference
karyotypes. Animal passage of a mixed cell
lture from a human biopsy can be used to select
d concentrate the tumor-producing cells as an
vivo cloning procedure.

45 CYTOLOGICAL STUDIES OF COLONIES IN CULTURE
DERIVED FROM THE PERIPHERAL BLOOD CELLS
TWO PATIENTS WITH ACUTE LEUKEMIA. *(E.)* Aye, M.
(Inst. Med. Sci., Univ. Toronto, Canada), J. E.
ll and E. A. McCulloch. *Exp Hematol* 2(6):362-371,
74.

e cytogenetic and morphological characteristics
individual cell colonies derived from the peri-
eral blood of two patients with acute leukemia
re studied. Peripheral blood cells from a pa-
ent with acute myeloblastic leukemia (AML) and
ronic myelogenous leukemia were cultured in the
esence and absence of leukocyte conditioned medium
CM). In both cases, LCM greatly stimulated colony
rmation, although the cells from the patient with
L formed some colonies without LCM. The direct
eparations from both patients had cytogenetic ab-
rmalities. The cells from the AML patient had
ny hypodiploid spreads and two distinctive marker
romosomes, while the other patient had a major
one with 49 chromosomes. The colonies derived
om the AML patient were euploid, while the colonies
rived from the second patient had the same karo-
pe observed in the direct preparations, or a tetra-
oid derivative of it. Using an inverted micro-
ope the colonies from the two patients were mor-
ologically indistinguishable. However, stained
eparations of colonies from the AML patient showed
rmal granulopoietic differentiation with numerous
nd forms and abundant granulation, while those
om the second patient contained large cells with
regularly shaped nuclei. The cells from the se-
nd patient appeared not to have matured beyond
e promyelocyte stage. The results indicate that
lls containing cytogenetic abnormalities found
leukemic populations can form colonies in culture.

4746 GROWTH CONTROL DIFFERENTIATED FETAL RAT HEPATOCYTES IN PRIMARY MONOLAYER CULTURE. V. OCCURRENCE IN DIALYZED FETAL BOVINE SERUM OF MACROMOLECULES HAVING BOTH POSITIVE AND NEGATIVE GROWTH REGULATORY FUNCTIONS. *(E.)* Leffert, H. L. (Cell Biol. Lab., Salk Inst., San Diego, Calif.). *J Cell Biol* 62(3):767-779, 1974.

The effect of various macromolecular serum fractions from dialyzed fetal bovine serum on the growth differentiated rat hepatocytes in primary monolayer culture was studied. The dialyzed fetal bovine serum contained two distinct growth-controlling macromolecular fractions: one stimulated and the other inhibited the proliferation of cultured hepatocytes. Both fractions were precipitated by ammonium sulfate. Serum fraction I (SFI, molecular wt about 120,000 daltons as estimated by gel filtration with Bio-gel P200) appeared to contain at least two factors which functioned, respectively, to initiate DNA synthesis and to increase the rate at which initiated cells move through the cell cycle. I.p. injections of SFI into adult Fisher/344 rats resulted in stimulation of hepatic but not renal DNA synthesis. Serum fraction II (SFII, molecular wt 40,000-80,000 daltons) suppressed the *in vitro* incorporation of CH_3-(^3H)thymidine into DNA under conditions which diminished neither cell viability nor cell attachment. Mixing experiments indicated that SFI and SFII mutually antagonized each other with respect to DNA synthesis and cell multiplication. Thus, both the relative and absolute levels of multiple serum factors control fetal hepatocyte proliferation *in vitro*.

4747 DISSOCIATION OF INCREASED HEXOSE TRANSPORT FROM INITIATION OF FIBROBLAST PROLIFERATION. *(E.)* Thrash, C. R. (Coll. Med., Univ. California, Irvine) and D. D. Cunningham. *Nature* 252(5478):45-47, 1974.

The relationship between hexose transport and proliferation was studied in density-inhibited 3T3 Swiss mouse fibroblast cultures. Cortisol at several concentrations that initiated DNA synthesis and cell division brought about a decrease in the transport of 3-O-methyl-D-glucose and 2-deoxy-D-glucose by density-inhibited 3T3 cells. Addition of fetuin (0.5 mg/ml) or 0.5% serum produced increased hexose uptake without subsequent proliferation. These results demonstrate that increased uptake is neither a necessary nor sufficient event for proliferation of density-inhibited 3T3 mouse fibroblasts. The conclusion that increased hexose uptake and proliferation may be unlinked is consistent with previous findings that treatment of mouse sarcoma virus-transformed BALB/c 3T3 cells with dibutryl cyclic AMP and theophylline sharply inhibited cell growth while stimulating glucose uptake.

4748 EFFECTS OF DIBUTYRYL CYCLIC ADENOSINE 3':5' MONOPHOSPHATE AND THEOPHYLLINE ON 2-DEOXY-D-GLUCOSE AND 2-AMINOISOBUTYRIC ACID UPTAKE BY HAMSTER EMBRYO CELLS. *(E.)* Kuroki, T. (Inst. Med. Sci., Univ. Tokyo, Japan) and S. Yamakawa. *Int J Cancer* 14(1):32-39, 1974.

Preincubation of hamster embryo cells with 1 mM dibutyryl cyclic adenosine 3':5' monophosphate (dibutyryl cAMP) and theophylline for 24 hr stimulated uptake of 2-deoxy-D-glucose and inhibited uptake of 2-aminoisobutyric acid. Uptake returned to control levels 22 hr after removal of the chemicals indicating that the effect is reversible. Hexokinase pattern was not changed suggesting the effect is on membrane transport and not on phosphorylation. Stimulation of glucose uptake by dibutyryl cAMP and theophylline occurred only in hamster embryo cells and their transformant HA-15. In human cervical carcinoma (HeLa), FM3A, mouse leukemia (L5178Y) and BALB/c mouse embryo cells (BALB/3T3) glucose uptake was not influenced; in the embryo cells of a DDD mouse (ME), inbred JAR rat cells (RE), chemically transformed HE cells (HA-8), Chinese hamster lung (V_{79}) and Chinese hamster ovary (CHO-KI) cells glucose uptake was inhibited. The uptake of 2-aminoisobutyric acid was not affected by the chemicals in CHO-KI, HeLa, L5178Y and BALB/3T3 cells, but was inhibited by them in the other cell lines. The results suggest that there are at least two mechanisms for the transport of nutrients in HE cells: cAMP-stimulated and cAMP-inhibited.

4749 DIRECTION OF TRANSCRIPTION OF THE REGULATORY GENE *ARAC* IN *ESCHERICHIA COLI* B/R.

(E.) Wilcox, G. (Dep. Biol. Sci., Univ. California, Santa Barbara), J. Boulter and N. Lee. *Proc Natl Acad Sci USA* 71(9):3635-3639, 1974.

A methodology for determining the direction of transcription of the regulatory gene, *araC*, in *Escherichia coli* B/r was developed. The procedure involved separating the DNA strands from *λparaC+B* and *λparaC3B (araC3* is a nonsense mutation) phages and then renaturing the single-stranded DNAs in all possible combinations. Subsequently, it was determined which of the renatured DNAs could direct *araC* protein synthesis in a cell-free system, as measured by the synthesis of L-arabinose isomerse from a $\lambda h80daraC^{+}A^{-}$ DNA which was also present in the synthesis mixture. As an internal control to rule out the possibility that some of the renatured DNAs might severely inhibit the cell-free system, the synthesis of β-galactosidase from a *λh80dlac* DNA, which was included in the synthesis mixture, was also measured. The native or renatured $C_H^{+}C_L^{+}$ DNA produced the *ara*C protein, which stimulated the synthesis of L-arabinose isomerase from the $\lambda h80daraC^{-}A^{+}$ DNA template. When the cell-free system contained a native or renatured *C3* DNA template, no L-arabinose isomerase was produced. The same result was obtained when the hybrid $C_H^{+}C_L^{3}$ DNA was used. However, when the hybrid DNA contained the light strand of the *λparaC+B* phage, $C_H^{3}C_L^{+}$ DNA, *araC* protein was synthesized in the cell-free system. The results indicate that the light strand is the codogenic strand of the *araC* gene on the *λpara C+B* phage DNA, while the *araB* gene is on the heavy strand (indicated by DNA·RNA hybridization). Thus, with regard to the standard *E. coli* map, *araC* is transcribed in a clockwise direction, whereas transcription of the *araBAD* operon has a counterclockwise orientation. The technique described should allow determination of the direction of transcription of any gene that can be incorporated into the genome of a specialized transducing phage.

4750 IDENTIFICATION AND PARTIAL CHARACTERIZATION OF MULTIPLE DISCRETE POLYADENYLIC ACID-CONTAINING RNA COMPONENTS CODED FOR BY HELA CELL MITOCHONDRIAL DNA.

(E.) Ojala, D. (Div. Biol., California Inst. Technol., Pasadena) and G. Attardi. *J Mol Biol* 88(1):205-219, 1974.

Poly(A)-containing RNA isolated from the components of a HeLa cell mitochondrial lysate which sediment in the polysome region of a sucrose gradient were analyzed for the presence of discrete species. The poly(A)-containing RNA components from the mitochondrial lysates were fractionated by gel electrophoresis, sedimentation through sucrose gradients under denaturing conditions, and RNA-DNA hybridization; the poly(A) content was measured. Eight distinct RNA components were identified and their occurrence and relative amounts were found to be stable under widely varying isolation conditions. One of these components was previously shown to have a sedimentation coefficient of about 7 S in the native state and a molecular weight of about 9.0×10^4 as estimated from its sedimentation rate in formaldehyde. The molecular weights of the other components ranged between 2.6 and 5.3×10^5. The 7 S RNA was complementary to the light mitochondrial DNA strand, while the other seven species were complementary to the heavy strand. Together with the two mitochondrial rRNA species and the mitochondrial 4S RNA, the eight poly(A)-containing RNA components, if distinct in sequence, would account for about 70% of the single-strand informational content of HeLa mitochondrial DNA. It is likely that the discrete poly(A)-containing components described here represent specific mtDNA-coded mRNA species.

4751 EXPRESSION OF THE MITOCHONDRIAL GENOME IN HELA CELLS. XIX. OCCURRENCE IN MITOCHONDRIA OF POLYADENYLIC ACID SEQUENCES, "FREE" AND COVALENTLY LINKED TO MITOCHONDRIAL DNA-CODED RNA.

(E.) Ojala, D. (Div. Biol., California Inst. Technol., Pasadena) and G. Attardi. *J Mol Biol* 82(1):151-174, 1974.

The distribution and characteristics of 4 S poly(A) sequences among different components of a HeLa mitochondrial lysate fractionated in a sucrose gradient were studied. The cells were subjected to a two-hr (8-^3H)adenosine pulse in the presence of 0.1 μg actinomycin D/ml. The poly(A) sequences were characterized according to their electrophoretic and sedimentation properties, response to ethidium bromide, physical relationship to mitochondrial RNA molecules, and homology to separated mitochondrial DNA strands. Labeled poly(A) segments of a size estimated to correspond to 60-80 nucleotides were present in the components of a mitochondrial lysate sedimenting in the mitochondrial polysome and ribosome-subunit region and, to a lesser extent, in the lighter components. The former structures contained mostly labeled RNA components heavier than 18 S ribosomal RNA, but also contained a considerable amount of newly synthesized and pre-existing mitochondrial ribosomal

NA, with only a relatively small amount of protein
ynthesizing structures. Substantially all of the
oly(A) associated with the slowest sedimenting com-
onents of the lysate was "free", the majority of the
emaining mitochondrial sequences being covalently
inked to mitochondrial RNA molecules. (8-^{3}H)-
denosine-labeling of the free and some of the RNA-
inked poly(A) was resistant to ethidium bromide at
μg/ml. RNA-DNA hybridization experiments showed
hat 1/2-2/3 of the poly(A)-containing mitochondrial
NA molecules labeled during a two-hr (5-^{3}H)uridine
r (8-^{3}H)adenosine pulse and isolated from the mito-
hondrial polysome or monomer-subunit region of the
radient were coded for by the heavy mitochondrial
NA strand, the rest being coded for by the light
trand. A fairly sharp peak of mitochondrial DNA-
oded, poly(A)-contained RNA which sedimented at
bout 7 S in the native state and about 20% faster
han 5 S RNA after formaldehyde treatment may repre-
ent a discrete species of mitochondrial messenger
NA. The data suggest that poly(A) synthesis in the
itochondria is a post-transcriptional event.

752 EXPRESSION OF THE MITOCHONDRIAL GENOME IN HELA CELLS. XXI. MITOCHONDRIAL PROTEIN SYN-
HESIS DURING THE CELL CYCLE. *(E.)*

England, J. M.
Div. Biol., California Inst. Technol., Pasadena) and
. Attardi. *J Mol Biol* 85(1):433-444, 1974.

he rate of mitochondrial protein synthesis in cells
n different phases of the cell cycle was studied to
etermine the occurrence and tightness of coupling
etween mitochondrial DNA replication and transcrip-
ion, the translation of mitochondrial messages, and
he dependence of organelle-specific protein synthesis
n the cell cycle. Chloramphenicol-sensitive (^{3}H)-
eucine incorporation into protein in synchronized
eLa cells continued throughout interphase, its rate/
ell approximately doubled between G_1 and G_2. This
ncrease did not appear to parallel the increase in
ell mass closely, the rate remaining constant dur-
ng the G_1 phase and accelerating with the onset of
uclear DNA synthesis. Correspondingly, on a per unit
ass basis, there appeared to be a slight decline in
he rate of (^{3}H)leucine incorporating into protein
uring the G_1 phase, which was compensated for by an
ncrease in the early S phase. No significant varia-
ions were observed in the mitochondrial leucine pool-
abeling during the cell cycle; thus, the observed
attern of (^{3}H)leucine incorporating into protein
hould reflect fairly accurately the behavior of
itochondrial protein synthesis. Evidence was ob-
ained indicating a depression in the rate of incor-
oration of (^{3}H)leucine into the mitochondrial pro-
ein of mitotic cells, but sodium dodecyl sulfate-
olyacrylamide gel electrophoresis of the products
f mitochondrial protein synthesis revealed no dif-
erences in the size distribution of the proteins
ynthesized during the various phases of the cell
ycle. The results suggest that the assembly of new
ctive protein synthesizing machinery occurs mainly
in the S and G_2 phases, that there is little or no
ell cycle-dependent differential control over the
ynthesis of mitochondrial protein products, and that
ost of the RNA species which serve as messengers for
itochondrial protein synthesis are relatively stable
r are synthesized throughout the cell cycle.

4753 DISTRIBUTION OF 5-BROMODEOXYURIDINE IN THE DNA OF RAT EMBRYO CELLS. *(E.)*

Schwartz, S. A. (Pritzker Sch. Med., Univ. Chicago, Ill.) and W. H. Kirsten. *Proc Natl Acad Sci USA* 71(9):3570-3574, 1974.

Rat embryo cells were treated with ^{3}H-labeled 5-bromodeoxyuridine(BrdU) to determine the nature of the substitution and distribution of the analog in DNA. At optimal oncornavirus-inducing doses of BrdU (10^{-4} M), density gradient centrifugation and DNA·DNA reassociation experiments revealed extensive (>90%) and uniform base substitution in repetitive, intermediate and unique DNA sequences. Suboptimal doses (10^{-7} M) of [^{3}H]BrdU resulted in less than 5% thymine replacement and nonrandom labeling of DNA. Treatment of cells with 10^{-7} M [^{3}H]dT resulted in relatively uniform labeling throughout all DNA sequences. At low concentrations, BrdU was incorporated predominantly within the repetitive and intermediate DNA of rat embryo cells. Moreover, the single-copy DNA sequences were lightly substituted and reassociated extensively only in the presence of excess unlabeled DNA. Such specificity of base substitution may be related to the unusually selective nature of BrdU effects on animal cells. Affinity of BrdU for a hypothesized mRNA that codes for a repressor of viral synthesis (or for hypothesized regulatory elements adjacent to structural genes) might affect regulation of, or interaction with, nuclear proteins responsible for repression or depression of cell-specific function.

4754 THE STIMULATORY EFFECT OF A SERUM FACTOR ON DNA AND PROTEIN SYNTHESIS IN HEPATOMA CELLS. *(E.)*

Dolan, M. L. (Univ. Pittsburgh Sch. Med., Pa.), M. L. Coetzee, M. Spangler and P. Ove. *Cancer Res* 34(11):3010-3017, 1974.

The effects of an isolated serum factor on the ability of rat liver and hepatoma 7777 cells to incorporate ^{3}H-thymidine and ^{3}H-leucine was studied The serum factor is present in normal rat serum but disappears from the serum of tumor-bearing rats and rats maintained on a low-protein diet; its properties are similar to those of an heptoglobin or hemopexin. The incorporation of both leucine and thymidine by liver and hepatoma cells *in vitro* was dependent on the amount of serum (up to 10%) added to the suspension medium. The hepatoma cells incorporated more leucine and thymidine with normal rat serum than with hepatoma rat serum; the source of the serum did not affect the ability of the liver cells to incorporate either label. When 100 μg of the serum factor was added to 5% hepatoma serum, incorporation of leucine was restored to 86% of that with normal rat serum; without added factor, incorporation with hepatoma serum was only 53% of that with normal rat serum. Addition of the factor to normal rat serum did not enhance incorporation. Ten μg of the serum factor alone stimulated incorporation at 99% of 5% normal rat serum, and 100 μg factor without any serum present supported incorporation at 198% of that with 5% normal rat serum. Results with thymidine incorporation were similar, except that the factor alone had a smaller effect on thymidine incorporation than on leucine incorporation. The factor may be synthesized by the liver, this synthesis continuing in hepatoma-bearing animals; however, the ever increasing number of hepatoma cells produced during tumor growth preferentially use the factor, causing its reduction and, finally, its disappearance.

4755 THE INTERRELATION BETWEEN DNA SYNTHESIS AND VARIOUS DNA POLYMERASE ACTIVITIES IN SYNCHRONIZED HELA CELLS. *(E.)* Spadari, S. (Roche Inst. Mol. Biol., Nutley, N.J.) and A. Weissbach. *J Mol Biol* 86(1):11-20, 1974.

The activities of three of the known DNA polymerases in HeLa cells were determined in synchronized HeLa cultures. The nuclei from synchronized cells were assayed for D-DNA polymerase I and II activity and R-DNA polymerase activity, and the DNA polymerases were analyzed by DEAE-cellulose chromatography. The R-DNA polymerase activity in both the nucleus and cytoplasm increased just before and parallel with the period of DNA synthesis (S phase); the enzyme level showed a maximum rise of 2.5-fold about two hr after the cells entered the S phase. The large molecular weight D-DNA polymerase II (about 2×10^5) in the cytoplasm increased slowly during the S phase, approaching maximum levels (2-fold increase) after the cessation of DNA synthesis. The D-DNA polymerase II activity in the nucleus did not vary significantly during this period, nor did the D-DNA polymerase I (molecular weight about 4×10^4) found in the nucleus. The results suggest that the R-DNA polymerase may be involved in the initiation or early stages of DNA replication; D-DNA polymerase I and II might then be involved in subsequent steps in the DNA synthesis.

4756 ACCUMULATION OF SINGLE-STRANDED REGIONS IN DNA AND THE BLOCK TO REPLICATION IN A HUMAN CELL LINE ALKYLATED WITH METHYL METHANE SULFONATE. *(E.)* Scudiero, D. (Dep. Microbiol., Univ. Chicago, Ill.) and B. Strauss. *J Mol Biol* 83(1):17-34, 1974.

The characteristics of the single-stranded regions (DNA$_{ss}$) produced during the course of DNA synthesis by control and methyl methane sulfonate (MMS)-treated cultures of human laryngeal carcinoma cells (HEp.2) were studied using radioactive labeling, chase experiments, DEAE-cellulose chromatography, hydroxyapatite chromatography, nuclease digestion, and sedimentation in alkaline and neutral sucrose gradients. DNA$_{ss}$ was observed after ten and 30 min labeling periods, the label becoming associated with native DNA after further incubation. Hydroxyurea induced an increase in the proportion of DNA$_{ss}$ and this increase was correlated with the inhibition of DNA synthesis. There was also a dose-dependent increase in the proportion of DNA$_{ss}$ synthesized after alkylation with MMS. The addition of hydroxyurea prevented the conversion of DNA$_{ss}$ into native DNA in both the control and alkylated cells. Single-stranded regions were also found in the parental DNA, the total extent of this region being greater in the parental than in the daughter DNA. The amount, as opposed to the proportion, of DNA$_{ss}$ was only slightly greater in the alkylated than in the control cultures, and the DNA synthesized eight hr after MMS treatment contained DNA$_{ss}$ in the same proportion as the controls. An MMS-induced increase in the incorporation of thymidine into the caffeine eluate from BND-cellulose indicated repair synthesis in the DNA$_{ss}$. The results suggest that the single-stranded regions are normal intermediates which occur transiently at the point of growth as a result of discontinuous DNA synthesis, that fragments of daughter DNA become single stranded as a result of strand displacement, that growth in the growing point region is held up by the alkylation lesion and that repair synthesis in the growing point region removes the alkylation lesion and permits DNA synthesis to continue.

4757 NUCLEOHISTONES OF THE GERMINATIVE CELLS OF PROLIFERATING MOUSE EPIDERMIS: A CYTOFLUOROMETRIC STUDY OF FREE-CELL PREPARATIONS. *(E.)* Alavaikko, M. (Dep. Pathol., Univ. Oulu, Finland). *Cytobios* 10(37/38):11-16, 1974.

An enzymatic method for the selective separation of proliferating mouse epidermis and its dissociation into free cells was tested for its applicability to the cytofluorometric estimation of the nucleohistones of similar cells. Combined with colchine pretreatment, the method yields free-cell preparations rich in metaphase cells with well preserved morphology and Feulgen reactivity. The cytofluorometry of metaphase cells stained with brilliant sulfaflavine showed values slightly more than 2-fold those of basal interphase cells of normal (e.g., resting) epidermis. A shift in the emission values of the basal interphase cells of proliferating epidermis in the direction of metaphase cells was analgous to the shift of Feulgen DNA values obtained in a similar cell population. These findings suggest a synchronous synthesis of nucleohistones and DNA in epidermal cells during the mitotic cycle. Stable average sulfaflavine emission values of metaphase cells, with no signficant differences between individual animals, indicated that a constant proportion of the available groups was stained.

4758 THE ASSOCIATION OF RNA WITH DISCONTINUOUS DNA REPLICATION IN HeLa CELLS. *(E.)* Binkerd, P. E. (Dep. Biochem. Biophys., Univ. California, Davis) and A. P. Toliver. *Cytobios* 10(40):221-233, 1974.

The association of RNA with the short-chain intermediates involved in DNA replication in HeLa cells was studied by density gradient techniques combined with ^{3}H-thymidine pulse labeling of nascent DNA. Zone sedimentation through alkaline sucrose showed that the early DNA intermediates were short chains that were gradually converted to longer ones. Chromatography on hydroxylapatite columns revealed that approximately 50% of this nascent DNA was single stranded. As the pulse time increased, virtually all of this DNA became double stranded. The nascent DNA made at early times banded at a slightly higher density than did the marker DNA in Cs_2SO_4 equilibrium density gradients. As the pulse time lengthened, the density of the intermediates returned to that of marker DNA. This conversion to normal density was coincident with the conversion of the short-chain intermediates to longer ones. These findings suggest that RNA functions as a primer in DNA replication and as replication proceeds this primer is hydrolyzed.

4759 TOPOLOGY OF REPEATED SEQUENCES: RELATIONSHIP OF NUCLEAR RNA TO THE REPEATED SEQUENCES OF THE MAIN AND SATELLITE DNA IN MOUSE PLASMOCYTOMA CELLS.

(E.) Pagoulatos, G. N. (Natl. Cent. Sci. Res., Univ. Paris, France). *Proc Natl Acad Sci USA* 71(9):3664-3668, 1974.

The topology of repeated sequences in mouse plasmocytoma DNA was studied by high-resolution CsCl density gradient centrifugation and heterogeneous nuclear RNA·DNA hybridization. Satellite region DNA of the plasmocytoma cells contained additional components and hybridized specifically with entire heterogeneous nuclear RNA molecules. A linkage was demonstrated between the A+T-rich satellite sequences and those hybridizing with heterogeneous nuclear RNA. Heavy DNA also hybridized specifically with heterogeneous nuclear RNA molecules which showed sequence similarity to the RNA hybridized to satellite DNA. These results could suggest that part of the satellite DNA became heavier after integration of some other DNA species, which could belong to a virus or to immunoglobulin repetitive genes. Dispersed, highly repetitive, short nucleotide sequences could constitute recognition sites for such a process.

4760 RNA POLYMERASES IN TRANSCRIPTION AND REPLICATION IN EUCARYOTIC ORGANISMS.

(E.) Rutter, W. J. (Dep. Biochem. Biophys., Univ. California, San Francisco), F. Masiarz and P. W. Morris. *Proc Int Symp Princess Takamatsu Cancer Res Fund, 4th, Tokyo* 55-65, 1973.

Studies of RNA polymerases in eucaryotic organisms are reviewed. In contrast to procaryotes, eucaryotic organisms contain multiple RNA polymerases. The properties and subunit structure of these enzymes are generally similar to that of the procaryotic enzyme, which suggests that the general mechanism of action and regulation are also similar. Available evidence indicates that there are several different transcriptive systems (an RNA polymerase, the array of genes trasncribed and regulatory elements) in eucaryotic organisms. Ribosomal RNAs and 4-5S RNAs are produced by polymerase I; most mRNAs and heterogeneous RNAs are produced by polymerase II. Organelles (e.g., mitochondria) also have a specific polymerase. Proteins stimulating both chain elongation and initiation have been described. Factors required for transcription by polymerases I and II on double-stranded but not only single-stranded templates have been discovered. These may be analogous to the procaryotic sigma factors. DNA synthesis in eucaryotes as well as in procaryotes is initiated by RNA synthesis. Initiation may be facilitated by the usual polymerases associated with transcription as their initiating sites (replicons = transcriptions). However, evidence obtained from studies on fertilized sea urchin eggs suggests that a specific polymerase (III) may be involved. Thus, DNA synthesis may be regulated *via* this specific RNA polymerase.

4761 THE METABOLISM OF A POLY(A) MINUS mRNA FRACTION IN HELA CELLS.

(E.) Milcarek, C. (Dep. Biol., Massachusetts Inst. Technol., Cambridge), R. Price and S. Penman. *Cell* 3(1):1-10, 1974.

About 30% of HeLa cell mRNA lacked poly(A) when labeled in the presence of different rRNA inhibitors; the method used to fractionate the cellular RNA precluded contamination of the poly(A)$^{-}$ mRNA with large amounts of poly(A)$^{+}$ sequences. The poly(A)$^{-}$ species was associated with polyribosomes, had an average sedimentation value equal to or greater than poly(A)$^{+}$ mRNA, and behaved like the poly(A)$^{+}$ mRNA in its sensitivity to EDTA and puromycin release from polyribosomes. At Rot values characteristic of abundant RNA sequences, there was little, if any, hybridization between the poly(A)- RNA fractions from total cytoplasm or from polyribosomes and ^{3}H-DNA made to poly(A)$^{+}$ RNA. This indicates that poly(A)$^{-}$ mRNA does not arise from poly(A)$^{+}$ mRNA by nonadenylation, deadenylation, or degeneration of random abundant mRNA sequences. The rate of accumulation of poly(A)- mRNA larger than 9S in the cytoplasm paralleled the accumulation of poly(A)$^{+}$ mRNA. The poly(A)$^{-}$ mRNA was maintained as approximately 30% of the total labeled mRNA over 90-min and 20-hr periods. The data indicate that poly(A)- mRNA is not short-lived nuclear or cytoplasmic heterogeneous RNA contamination, and that the half-life of the poly(A)- mRNA may parallel that of the poly(A)$^{+}$ mRNA. Cordycepin appears to inhibit poly(A)$^{+}$ mRNA almost completely (95%), while only partially (60%) inhibiting the poly(A)- mRNA. The origin of the cordycepin-insensitive mRNA has not been ascertained.

4762 ISOLATION AND CHARACTERIZATION OF HIGHLY LABELED RIBOSOMAL RNA FROM HUMAN LEUKEMIC CELLS.

(E.) Seeber, S. (Dep. Intern. Med., Tumor Res. Div., Essen, West Germany) and C. G. Schmidt. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:298-301, 1974.

The intense ^{32}P-labeling, nucleotide analysis and sequencing of 28S ribosomal RNA from cells in the blood of untreated patients with acute myelocytic, acute lymphoblastic, chronic lymphocytic leukemias, leukemic lymphosarcoma and Burkitt lymphoma were used to compare the primary ribosomal RNA structure. Isolated cells were incubated with 20 mCi ^{32}P-orthophosphate/g packed cells/100 ml medium for nine hr at 37 C and then processed for the isolation of ribosomes. RNA was extracted by a phenol-detergent method and fractionated on a 6-40% sucrose gradient. Three labeling peaks were identified, corresponding to 5S, 18S and 28S fractions, the 18S and 28S specific activity values being similar for all leukemias. No significant variations were noted for nitrogen base comparisons or nucleotide sequencing among the various leukemic cell types.

4763 NEUROBLASTOMA CELLS IN CULTURE: ^{32}P-PHOSPHOPROTEIN LABELING AND PROTEIN KINASE ACTIVITY. *(E.)* Casola, L. (Int. Inst. Genet. Biophys., Naples, Italy), G. Di Matteo and G. Augusti-Tocco. *Exp Neurol* 44(3):417-423, 1974.

^{32}P-phosphoprotein labeling and the protein kinase activity of neuroblastoma cells growing in suspension and monolayer cultures were compared to determine the role of protein phosphorylation in the extension of neurites by and the appearance of microtubular structures in these cells. Thin-layer chromatography and labeling with ^{32}P-orthophosphate were used to determine the ATP pool in cultures of NB41A3 neuroblastoma cells; the cells were also assayed for ^{32}P-orthophosphate labeling and protein kinase. Growth of the neuroblastoma cells in monolayer culture was accompanied by neurite outgrowth, whereas neurites were absent in the cells growing in suspension. The rate of ^{32}P-labeling of the phosphoproteins did not differ under the two culture conditions, nor did the activity of protein kinase; there was little or no stimulation of kinase activity by cAMP. It is concluded that the appearance of microtubular structures observed in monolayer cultures does not depend on an increased level of protein kinase activity.

4764 NUCLEAR DNA POLYMERASES DURING EXPERIMENTAL NEOPLASIA OF RAT LIVER. *(E.)* Chiu, J. F. (M.D. Anderson Hosp. Tumor Inst., Houston, Tex.), C. Craddock, H. P. Morris and L. S. Hnilica. *Cancer Biochem Biophys* 1(1):13-21, 1974.

The activities of rat liver nuclear DNA polymerase enzymes were studied during chemical carcinogenesis. Male Fischer rats were maintained on a basal commercial diet or on the basal diet supplemented with 0.06% N,N-dimethyl-p-(m-tolylazo) aniline (3'-MDAB) or 0.05% α-naphthylisothiocyanate (α-NIT). A high molecular weight (6-8 S) DNA polymerase activity appeared in a tightly bound form in the liver nuclei about two weeks after the introduction of 3'-MDAB into the diet; it increased rapidly, reaching a maximum within 30-40 days, and thereafter gradually decreasing. No similar enzyme could be detected in the liver nuclei of the rats maintained on the basal diet or in those of the α-NIT-fed animals. The high molecular weight nuclear DNA polymerase activity was also found in rat embryos, neonatal rat liver, and several Morris hepatomas removed from male Sprague-Dawley rats. The nuclear 6-8 S DNA polymerase activity of the Morris hepatomas could be directly correlated to their growth rate and degree of differentiation. The 6-8 S polymerase activity was only marginally detectable in the nuclei of regenerating liver following partial hepatectomy. In contrast to the rat liver cytoplasmic 6-8 S DNA polymerase, the nuclear enzyme used both native and heat-denatured DNA as templates, and was less responsive to the stimulating effect of sulfhydryl compounds. Both enzymes required all four deoxynucleoside triphosphates, Mg^{2+}, and DNA as template. The results indicate that the nuclear 6-8 S DNA polymerase is not a contaminant of the cytoplasmic 6-8 S enzyme.

4765 NUCLEOSIDE TRIPHOSPHATASE ACTIVITY AT THE EXTERNAL SURFACE OF NEUROBLASTOMA CELLS. *(E.)* Stefanovic, V. (CNRS Neurochem. Cent., Univ. Strasbourg, France), J. Ciesielski-Treska, A. Ebel and P. Mandel. *Brain Res* 81(3):427-441, 1974.

An ATP splitting activity was studied *in vitro* at the external surface of a neuroblastoma clonal cell line, NIE-115. A sensitive method was developed which permits determination of enzyme activity at the surface of cells which remain *in situ* during the entire incubation. Evidence is presented that this ATPase activity is located at the external surface of the neuroblastoma cell plasma membrane. The enzyme appears to be firmly bound to the cell membrane. Preliminary attempts to solubilize this ATPase activity have so far been unsuccessful. Magnesium ions have a strong activating effect and the enzyme is completely inactivated by ethylenediaminetetraacetic acid (EDTA). The basal, Mg^{2+}-dependent activity was stimulated by the presence of K$^+$ ions, but not by Na$^+$ ions, in the medium. Maximum stimulation was obtained using 5 mM K$^+$ ions in the medium. The activation effect of K$^+$ ions was inhibited by the presence of ouabain in the incubation fluid. Half maximal inhibition was obtained at an ouabain concentration of approximately 10^{-7} M. Activation by K$^+$ ions was retarded by Na$^+$ ions. Li$^+$, Cs$^+$ and NH$_4^+$ ions at a concentration of 5 mM, produced no stimulation of the basal, Mg^{2+}-dependent activity. ATP hydrolysis was maximal between pH 7.2 and 8.2, with cells incubated in medium containing Mg^{2+} plus K$^+$ ions. Ouabain sensitive activity had a pH optimum between 7.4 and 7.8. Other nucleoside triphosphates might serve as substrates. Nucleoside diphosophates were hydrolyzed at appreciable rates, but nucleoside monophosphates were not. Kinetic studies of the enzyme *in situ* revealed an apparent K$_m$ value for ATP of 1.3 x 10^{-4} M. The ionic affinities and ouabain sensitivity of ATP hydrolysis suggest that the enzyme may be involved in cation transport.

4766 LEUKOCYTE ALKALINE PHOSPHATE ACTIVITY IN WOMEN WITH GENITAL TRACT TUMORS. *(E.)* Jedwab, G. A. (Munic. Gov. Med. Cent., Tel Aviv, Israel), M. P. David, Y. Burstein and N. Soferman. *Israel J Med Sci* 10(11):1430-1433, 1974.

Leukocyte alkaline phosphatase (LAP) activity was determined in postmenopausal women with various benign and malignant tumors of the genital tract. The mean LAP score in 30 normal control women was 44. An increased mean LAP score of 158 was found in 15 patients with various nongynecological malignant tumors. High mean LAP scores of 225 and 255 were found in seven patients with ovarian tumors (papillary adenocarcinomas or granulosa-theca cell tumors) and in six with squamous carcinoma of the cervix, resp. Eleven postmenopausal women with benign leiomyomas of the uterus showed a low mean LAP score of 49. No significant increase in LAP activity was seen in seven patients with well-differentiated adenocarcinomas of the endometrium, limited to the inner third of the myometrium (mean score of 88). Results suggest that LAP activity determinations are not of clinical value in the early diagnosis of endometrial cancer. Characterization of the type of estrogen produced is needed to evaluate the relationship of the LAP score to estrogen-producing ovarian tumors.

4767 HORMONAL CONTROL OF MALIGNANT TUMOURS. *(E.)*

Moricca, G. (Regina Elena Inst. Study Cure Tumors, Rome, Italy) and F. Colistro. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:218-232, 1974.

A new procedure for the ablation of the pituitary gland in cases of advanced breast and other cancers is described. The marginal superiority of hypophysectomy over oophorectomy or adrenalectomy for palliation of hormone-dependent tumors is first demonstrated by statistical evaluation of clinical data. Syringe needles (one or more) are guided intranasally by radiographic control (under local anesthetic) into the sella turcica, and a total of 0.6-2.0 ml of ethyl alcohol injected. The procedure can be repeated several times. A total of 687 patients were treated with this procedure over a ten-year period. Most had breast cancer, some had other hormone-dependent cancers and some had non hormone-dependent cancers. All cases were advanced metastatic cancers with severe pain and were unresponsive to other therapy. While complete evaluation of all patients was not possible, about one third showed amelioration or disease arrest with some eight-year survivors. The procedure is less hazardous than surgical hypophysectomy and simpler to perform. Side effects and consequences are generally mild but its great advantage is the elimination of pain even in hormone-independent, advanced cancer.

4768 PROLACTIN CONCENTRATIONS IN PATIENTS WITH BREAST CANCER. *(E.)*

Franks, S. (Middlesex Hosp. Med. Sch., London, England), D. N. L. Ralphs, V. Seagroatt and H. S. Jacobs. *Br Med J* 4(5940):320-321, 1974.

The basal serum prolactin concentrations were measured in a group of 113 women undergoing surgery for lesions of the breast and results for benign and malignant tumors were compared. The mean prolactin concentration in 50 normal women was 6.5 ng/ml and in this group no significant difference was noted in prolactin concentrations between premenopausal and postmenopausal women. Among the patients, no significant difference was noted in prolactin levels when comparing those with benign lesions with those having malignant lesions. The incidence of hyperprolactinemia was significantly higher, however, in the premenopausal than in the postmenopausal group. Prolactin concentrations were greatly increased in six patients with benign lesions of the breast and in one patient with cancer. Of the six, four were premenopausal patients, three of whom had fibroadenomas and one (who was taking oral contraceptives) had a lump caused by fatty tissue and fibrosis. Prolactin was not raised in the 20 other premenopausal patients in this series who had fibroadenomas. Both postmenopausal patients with benign lesions and raised prolactin concentrations had duct ectasia as did two other postmenopausal patients whose prolactin concentrations were normal. The one patient with malignant disease and hyperprolactinemia had an adenocarcinoma. These results do not support an etiological relation between hyperprolactinemia and breast cancer. It is suggested that the cause of the hyperprolactinemia in the seven patients with levels above 25 ng/ml was the psychological stress associated with the fear of surgery for a lump in the breast. The need for a strictly matched control group in evaluating hormonal profiles in cancer patients is stressed.

4769 AGE AT FIRST BIRTH: AN EQUIVOCAL FACTOR IN HUMAN MAMMARY CARCINOGENESIS. *(E.)*

Juret, P. (Dep. Med., Cent. Francois Baclesse, Caen, France), J. -E. Couette, D. Brune and J. -C. Vernhes. *Eur J Cancer* 10(9):591-594, 1974.

Multiparity and early first birth were investigated in relation to age at clinical onset of human breast cancer. Parity and age at first birth were ascertained from the records of 790 patients treated for carcinoma of the breast during a three yr period. It was found that breast cancer appeared earlier after a high than after a low parity, but occurred significantly earlier in patients who bore their first child at an early age; proportionally, the later the first delivery, the later the onset of the disease. The conclusion of the investigation is in opposition to the authors' original hypothesis; the finding that early first birth reduces the total risk of breast cancer but accelerates the onset of the disease may be accounted for by a faster growth of the malignancy.

4770 A STUDY OF SERUM NERVE GROWTH STIMULATING ACTIVITY IN PATIENTS WITH NEUROFIBROMATOSIS UTILIZING A MODIFIED BIOASSAY TECHNIQUE. *(E.)*

Tischler, A. S. (Beth Israel Hosp., Boston, Mass.). *Exp Neurol* 44(3):440-447, 1974.

Serum samples from normal human subjects and from patients with disseminated neurofibromatosis and solitary Schwannomas were assayed for nerve growth-stimulating activity. The assay uses a modification of the standard bioassay and employs a drop dilution technique and polystyrene apparatus in place of glass. Nerve growth stimulating activity was present in every sample studied, in contrast to previous reports, and extended up to 10-fold dilutions. Peaks of activity occurred at higher dilutions than with the standard assay, and the dilution curves sometimes appeared multimodal. No differences were observed between human plasma and serum and there were no quantitative differences between the sera from the normal subjects and those with neurofibromatosis. Omission of fetal calf serum from the incubation medium and freezing and storage of the human serum samples caused some diminution in activity. The results indicate that the modifications employed in this study improve the sensitivity obtained with the standard bioassay method.

4771 LACK OF CORRELATION BETWEEN FIBRINOLYSIS AND THE TRANSFORMED STATE OF CULTURED MAMMALIAN CELLS. *(E.)* Mott, D. M. (Inst. Cancer Res., Fox Chase Cancer Cent., Philadelphia, Pa.), P. H. Fabisch, B. P. Sani and S. Sorof. *Biochem Biophys Res Commun* 61(2):621-627, 1974.

Ten different types of serially cultured, growing cells were examined for their extracellular fibrinolytic activity to determine whether any correlation exists between fibrinolysis and cell transformation. The cell lines examined included Swiss mouse fibroblasts (3T3) and their simian virus 40 (SV40)-transformed derivatives (SV74C), spontaneously transformed Chinese hamster ovary cells (CHO-K1), Chinese hamster kidney fibroblasts (CHK-C16a) and an SV40-transformed (14SVM1) and polyoma virus-transformed (13PYM1) subline, normal human diploid (WI-38) and SV40-transformed WI-38 (38-VAi3-2RA) cells, and SV40-transformed WI-26 cells (WI-26-VA4). The CHK and SV-CHK cells liberated little and no extracellular activator of plasminogen, resp., while both the 3T3 and SV-3T3 cells produced high levels of extracellular activator activity. The WI-38 and WI-26 cells also exhibited fairly high activator activities, while their SV40-transformed derivatives produced virtually none. The CHO fibroblasts liberated large amounts of plasminogen activator. The results indicate no correlation between fibrinolytic activity and state of transformation or nontransformation.

4772 CARCINOGENESIS AT THE CELLULAR LEVEL. *(E.)* Klein, G. (Karolinska Inst., Stockholm, Sweden). *Radiat Res* 58(1):73, 1974.

4773 FURTHER STUDIES OF MUTATION IN CHINESE HAMSTER CELLS *IN VITRO*. *(Rus.)* Khalizev, A. E. (I. V. Kurchatov Inst. At. Energy, Moscow, USSR), O. N. Petrova and N. I. Shapiro. *Genetika* 10(7):43-54, 1974.

4774 CORRELATION BETWEEN THE INTENSITY OF *IN VITRO* MIGRATION OF PERITONEAL EXUDATE CELLS AND THE QUANTITY OF NONADHERENT CELLS. *(E.)* Kalafut, F. (Cancer Res. Inst., Bratislava, Czechoslovakia) and J. Medzihradsky. *Neoplasma* 21(6): 639-644, 1974.

4775 MODERN KARYOLOGICAL FEATURES OF CARCINOMAS OF THE FEMALE BREAST. *(It.)* Marcozzi, G. (3rd Surg. Clin., Univ. Rome, Italy), S. Messinetti, G. Zelli and M. Moscarini. *Arch De Vecchi Anat Patol* 38(1/2/3):213-224, 1973.

4776 POLYSOMAL PROTEINS IN RAT LIVER AND DAB-1 HEPATOMA. *(E.)* Nourse, L. D. (Natl. Chem. Res. Lab., Counc. Sci. Ind. Res., Pretoria, South Africa), C. F. Albrecht and I. M. van Zyl. *S Afr J Sci* 70(3):87, 1974.

4777 NUCLEAR MEMBRANES IN RAT LIVER AND DAB-1 HEPATOMA. *(E.)* Van Zyl, I. M. (Natl. Chem. Res. Lab., Counc. Sci. Ind. Res., Pretoria, South Africa). *S Afr J Sci* 70(3):86-87, 1974.

4778 INFORMOFERS IN RAT LIVER AND DAB-1 HEPATOMA. *(E.)* Albrecht, C. F. (Natl. Chem. Res. Lab., Counc. Pretoria, South Africa). *S Afr J Sci* 70(3):86, 1974.

4779 RELATIONSHIP BETWEEN CYCLIC AMP LEVEL AND DIFFERENTIATION OF NEUROBLASTOMA CELLS IN CULTURE. *(E.)* Prasad, K. N. (Univ. of Colorado Med. Cent., Denver), S. K. Sahu and S. Kumar. *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* pp. 287-307, 1973.

4780 CHARACTERIZATION OF ACTIVE POLYSACCHARIDE STRUCTURES IN A SEROLOGICAL REACTION USED FOR THE STUDY OF TUMORS. *(It.)* Lovisetto, P. (Inst. Clin. Gen. Med., Univ. Turin, Italy), G. Guarini, M. Marzona, V. Biarese and G. Molfese. *Tumori* 60(3): 255-256, 1974.

4781 QUANTITATIVE CYTOCHEMICAL STUDY OF TOTAL PROTEINS IN EHRLICH TUMOR CELLS. *(Fr.)* Lepoint, A. (Inst. Histol., Liege, Belgium), R. Bassleer and F. De Paermentier. *C R Acad Sci [D] (Paris)* 279:1229-1231, 1974.

4782 NUCLEIC ACID CONTENTS OF MYOMAS. *(Rus.)* Breusenko, V. G. (Moscow Reg. Res. Inst. Obstet. Gynecol., USSR). *Akush Ginekol (Mosk)* (10): 60-61, 1974.

4783 MUCOPOLYSACCHARIDES IN THE EPITHELIAL COMPONENT OF NORMAL MUCOSA AND CARCINOMAS OF THE RECTUM AND RECTOSIGMOID. *(Rus.)* Lazarev, I. M. (Moscow Sci. Res. Inst. Oncol., USSR). *Lab Delo* (6):335-338, 1974.

4784 ISOELECTRIC FOCUSING OF THE CADMIUM ION-BINDING PROTEIN OF RAT LIVER: INTERACTION OF THE PROTEIN WITH A GLYCOSAMINOGLYCAN. *(E.)* Webb, M. (Strangeways Res. Lab., Cambridge, England) and R. W. Stoddart. *Biochem Soc Trans* 2(6):1246-1248, 1974.

4785 SERUM CHEMICAL TEMPLATES FOR ALCOHOLISM, HIGH AND LOW GAMMA-GLUTAMYL TRANSPEPTIDASE. *(E.)* Casey, A. E. (Mem. Inst. Pathol., Birmingham, Ala.), L. M. Hall, J. Myrick, J. G. Gravlec and E. L. Downey. *Am J Pathol* 74(2):103A, 1974.

4786 STUDIES ON ACTIVITY OF ALDOLASE AND ISOZYME IN NORMAL UTEROVAGINAL REGION AND TISSUE OF CANCER OF THE CERVIX. *(E.)* Fujiwara, Y. (Tokyo Med. Coll., Japan), K. Akiya, S. Furuya and E. Umebayashi. *Acta Obstet Gynaecol Jpn* 20(1):57, 1973.

4787 ALKALINE PHOSPHATASE AND ULTRASTRUCTURAL ALTERATIONS IN HUMAN OSTEOSARCOMA CELLS IN TISSUE CULTURE. *(E.)* Singh, I. (Med. Coll. Ohio, Toledo), K. Y. Tsang and G. D. Ludwig. *Eur Surg Res* 6(4):247-263, 1974.

4788 LIPIDS OF CULTURED HEPATOMA CELLS: IV. EFFECT OF SERUM AND LIPID UPON CELLULAR AND MEDIA NEUTRAL LIPIDS. *(E.)* Wood, R. (Univ. Missouri Sch. Med., Columbia) and J. Falch. *Lipids* 9(12):979-986, 1974.

4789 LIPIDS OF CULTURED HEPATOMA CELLS. V. DISTRIBUTION OF ISOMERIC MONOENE FATTY ACIDS IN INDIVIDUAL LIPID CLASSES. *(E.)* Wood, R. (Univ. Missouri Sch. Med., Columbia), J. Falch and R. D. Wiegand. *Lipids* 9(12):987-992, 1974.

4790 THE SPECIFICITY OF CHANGES IN THE TISSUE MINERAL BALANCE IN CANCER. *(Rus.)* Aidinian, R. A. (Armenian Inst. Roentgenol. Oncol., Erevan, USSR). *Zh Eksp Klin Med* 14(3):61-68, 1974.

4791 STUDIES ON THE DISTRIBUTION OF H^3-17β-OESTRADIOL AND H^3-PROGESTERONE IN NORMAL AND MALIGNANT TISSUES OF THE RAT USING A NEW AUTORADIOGRAPHIC TECHNIQUE. *(E.)* Trams, G. (Dep. Obstet. Gynaecol., Univ. Hamburg, West Germany) and A. F. Holstein. *J Steroid Biochem* 5(4):338-339, 1974.

4792 CELL PROLIFERATION IN MAMMARY EPITHELIUM AND CORRELATED HISTOCHEMICAL FLUCTUATIONS IN MAST CELLS DURING THE ESTROUS CYCLE. *(E.)* Purnell, D. M. (M. S. Hershey Med. Cent., Pennsylvania State Univ., Hershey), J. W. Combs and G. C. Saggers. *J Natl Cancer Inst* 52/53(1/6):1691-1697, 1974.

4793 SPECIFIC BINDING OF TESTOSTERONE (T) AND 5α-DIHYDROTESTOSTERONE (5α-DHT) TO PLASMA PROTEINS IN HUMAN MALES WITH BENIGN PROSTATIC HYPERTROPHY, PROSTATIC CARCINOMA, AFTER HYPOPHYSECTOMY AND AFTER ORCHIDECTOMY. *(E.)* Horst, H. J. (Dep. Clin. Chem., Univ. Hamburg, West Germany), H. Becker and K. D. Voigt. *J Steroid Biochem* 5(4):338, 1974.

4794 STEROID HORMONE RECEPTORS IN HUMAN RENAL CARCINOMA. *(E.)* Fanestil, D. D. (Dep. Med., Univ. California, La Jolla), D. A. Vaughn and J. H. Ludens. *J Steroid Biochem* 5(4):338, 1974.

4795 AUTORADIOGRAPHIC AND CYTOPHOTOMETRIC ANALYSES OF THE RESTING STAGES OF THE L1210 ASCITES TUMOR. *(E.)* Hartmann, N. R. (Finsen Inst., Copenhagen, Denmark) and P. Dombernowsky. *Cancer Res* 34(12):3296-3302, 1974.

4796 STUDIES ON THE BACTERIOPHAGE PS-8 OF *AGROBACTERIUM TUMEFACIENS* (SMITH AND TOWNSEND) CONN: PURIFICATION AND PROPERTIES. *(E.)* Knopf, U. C. (Genet. Group, Univ. California, Davis). *Arch Gesamte Virusforsch* 46(3/4):205-216, 1974.

4797 DYNAMICS OF LEUKOCYTE MIGRATION INTO THE MOUSE ASCITES TUMOR. *(E.)* Lala, P. K. (Dep. Anat., McGill Univ., Montreal, Canada). *Cell Tissue Kinet* 7(3):293-304, 1974.

4798 STUDIES ON ALTERATIONS OF CIRCULATING LEUKOCYTES, OF THE EPITHELIUM OF THE ORAL CAVITY, AND OF CELLS OF THE SKIN WINDOW IN THE COURSE OF PRIMITIVE PULMONARY NEOPLASIA. *(It.)* Perna, L. (Clin. Tisiol., Univ. Siena, Italy), P. Mescolini, M. Sbampato, L. Rebek, S. Luchini and A. Renieri. *Lotta Tuber Mal Pol Soc* 43(1):3-20, 1973.

4799 TRANSMISSION AND EXPRESSION OF THE LEUKEMIA INDUCING AGENT IN BALB/cf(RIII) MICE. *(E.)* Squartini, F. (Med. Sch. Univ. Pisa, Italy), E. Bucciarelli and G. B. Bolis. *Bibl Haematol* (39):345-456, 1973.

4800 "TEA-GRUEL" AS A POSSIBLE FACTOR OF THE ESOPHAGUS. *(E.)* Anonymous. *Indian J Cancer* 11(2):232-233, 1974.

* INDICATES A PLAIN CITATION WITHOUT ACCOMPANYING ABSTRACT

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PREFACE

Carcinogenesis Abstracts is a publication of the National Cancer Institute. The journal serves as a vehicle through which current documentation of carcinogenesis research highlights are compiled, condensed, and disseminated on a regular basis. It represents an integral part of the Institute's program of fostering and supporting coordinated research into cancer etiology. Issues of *Carcinogenesis Abstracts* normally contain three-hundred abstracts and three-hundred citations (unaccompanied by corresponding abstracts). Abstracts and citations refer to the current scientific literature that describes the most significant carcinogenesis research carried on at the National Cancer Institute, other governmental agencies, and private institutions. *Carcinogenesis Abstracts* is intended to be a highly useful current awareness tool for scientists engaged in carcinogenesis research or related areas. The great number and diversity of publications relevant to carcinogenesis make imperative the availability of this service to investigators whose work requires that they keep abreast with current developments in the field.

Carcinogenesis Abstracts is normally published monthly. Volume XII covers the scientific literature published from Jan 1974 through Dec 1974. To increase the usefulness of *Carcinogenesis Abstracts*, Volume XII, a Wiswesser Line Notation index and a Chemical Abstracts Service Registry Number index have been provided. These indexes reference compounds described in abstracted articles. A cumulative subject, author, CAS Registry Number, and Wiswesser Line Notation index for Volume XII will be published shortly after the final regular issue.

Carcinogenesis Abstracts is available free of charge to libraries and to individuals who have a professional interest in carcinogenesis. Requests for *Carcinogenesis Abstracts* from qualified individuals should include statements of their relationship to carcinogenesis research. All correspondence should be addressed as follows.

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NOTE

Journal names are abbreviated according to the list of abbreviations used by *Index Medicus.* For urnals not covered by *Index Medicus,* the abbreviations (with some modifications) found in *World Medical riodicals,* 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans
Ar.	Arabic
Bul.	Bulgarian
Ch.	Chinese
Cz.	Czech
Dan.	Danish
Dut.	Dutch
E.	English
Eston.	Estonian
Fin.	Finnish
Fl.	Flemish
Fr.	French
Ger.	German
Gr.	Greek
Heb.	Hebrew
Hun.	Hungarian
Ic.	Icelandic
In.	Indonesian
It.	Italian
Jap.	Japanese
Kor.	Korean
Latv.	Latvian
Lith.	Lithuanian
Nor.	Norwegian
Pol.	Polish
Por.	Portuguese
Rum.	Rumanian
Rus.	Russian
Ser.	Serbo-Croatian
Sl.	Slovak
Sp.	Spanish
Sw.	Swedish
Th.	Thai
Turk.	Turkish
Uk.	Ukrainian
Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

TH	adrenocorticotropic hormone
P	adenosine diphosphate
P	adenosine monophosphate
P	adenosine triphosphate
	degrees centigrade
	centimeter(s)
S	central nervous system
n	counts per minute
A	deoxyribonucleic acid
g.	for example
	gram(s)
	microgram(s)
	hour(s)
n.	intramuscular
p.	intraperitoneal
	international unit(s)
v.	intravenous
	kilogram(s)
0	median lethal dose(s)
	meter(s)
	molar
	milliequivalent(s)
	millimolar
	micromolar
μC	milli-,microcurie(s)
mg	milligram(s)
min	minute(s)
ml	milliliter(s)
mm	millimeter(s)
MTD	maximum tolerated dose
ng	nanogram (10^{-9})
pg	picogram (10^{-12})
p.o.	orally
ppm	parts per million
r	Roentgen
RBC	red blood cells (erythrocytes), red blood count
resp.	respectively
RNA	ribonucleic acid
s.c.	subcutaneous
sec	second(s)
U	unit(s)
UV	ultraviolet
WBC	white blood cells (leukocytes), white blood count
wk	week(s)
wt	weight(s)
yr	year(s)

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4801 QUANTITATIVE ASPECTS OF *IN VITRO* CHEMICAL CARCINOGENESIS.

(E.) DiPaolo, J. A. (Natl. Cancer Inst., Bethesda, Md.). *Biochem Dis* 4(Part B): 443-455, 1974.

Three aspects of the use of mammalian cells in culture for the development of *in vitro* models for screening environmental factors that are potential carcinogens to humans are considered in this review: 1) the evidence that supports the concept that cancer can be studied *in vitro*; 2) the basic biologic questions to be asked in *in vitro* chemical carcinogenesis; and 3) the factors that influence transformation. A quantitative system for studying transformation was developed using mixed hamster embryo cells plated on an irradiated rat embryo feeder layer. Several hr after seeding, 6 to 24 hr post-plating, they were treated with a carcinogen for a period of time ranging from a half-hr to seven days. Two types of colonies formed: those that are oriented and those that are disoriented and show a criss-crossing of cellular elements. The latter are transformed colonies, their cells are refractory and continue to undergo mitosis. The transformation may be expressed in several ways; the number of transformed colonies/dish; the number of transformed colonies/cells plated; or the number of transformed colonies/total number of colonies obtained. Using this *in vitro* system, experiments were performed that indicate that transformation is due to induction and not to selection. Dose-response experiments in this system have led to the conclusion that transformation is independent of toxicity because after all carcinogen-sensitive cells are killed and only resistant cells remain, transformation continues to increase. These experiments also show that transformation follows a linear relationship with dose. Studies that indicate that *in vitro* activity correlates with *in vivo* activity are also reviewed providing evidence that chemically induced carcinogenesis can be studied *in vitro*. (32 references)

4802 THE THREE-TIER APPROACH TO MUTAGENICITY SCREENING AND THE CONCEPT OF RADIATION-EQUIVALENT DOSE.

(E.) Bridges, B. A. (Med. Res. Counc. Mutat. Res. Unit, Univ. Sussex, Brighton, England). *Mutat Res* 26(4):335-340, 1974.

A three-tier approach to mutagenicity screening is proposed, based on three general principles. The first tier consists of *in vitro* tests which would be the only tests to which chemical compounds not intended for direct ingestion would be subjected (e.g., industrial chemicals). Substances intended for ingestion (e.g., food additives and medicines) and other widespread substances likely to accumulate in the body would, if they gave negative results in the first tier tests, be subjected to a second tier of *in vivo* testing in whole mammals. Substances giving positive results in either of these tests would pass to a third tier of evaluation. While the first two tiers comprise tests for the detection of mutagenic activity, the object of the third tier is to provide a quantitative estimate of the mutational risk to man, followed by a risk-benefit assessment. One way of comparing the effect of one agent with that of another might be to express it as a radiation-equivalent dose (in radEq U). Ideally, radEq values should be obtained for mutations at several loci and for several cell types. (3 references)

4803 TRANSPLACENTAL AND NEONATAL CARCINOGENESIS: EXPERIMENTAL APPROACH.

(E.) Vesselinovitch, S. D. (Pritzker Sch. Med., Chicago, Ill.). *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:135-150, 1974.

The susceptibility of the new-born mammal to chemical carcinogenesis during the prenatal period is supported by a review of experimental evidence from both animal and human sources in which either the mother or the animal offspring were exposed to carcinogens. Clinical evidence is presented from human transplacental carcinogenesis resulting from maternal exposure to diethylstilbestrol with consequent induction of vaginal cancer in female offspring. The effect of gestational age in maternal mice (at the time of carcinogen exposure) on the type of tumor produced and the effect of administering the procarcinogen, ethyl urea, and its activator, sodium nitrite, is described. The administration of ethylnitrosourea to newborn mice and the type of tumor produced correlated with the weanling's age at the time of carcinogen exposure. Neonatal carcinogenicity of other substances such as aflatoxin B_1, benzidine and diethyl nitrosamine, which requires liver activation, are reviewed. Enhanced sensitivity to carcinogens of the fetus and newborn organism, demonstrated in animal studies, suggests that the maximum nonhazardous level of carcinogen to a human mother may prove carcinogenic to her fetus. (82 references)

4804 ASPECTS OF CARCINOGENESIS BY ASBESTOS.

(E.) Botham, S. K. (Univ. Reading, England) and P. F. Holt. *Proc Fifth Int Symp Biol Characterization Hum Tumors* 1:117-122, 1974.

Several aspects of carcinogenesis by asbestos are reviewed. Inhaled asbestos can cause carcinoma of the lung or mesothelioma and has been implicated in carcinoma of the larynx. Also, the risk of an asbestos worker developing cancer is far greater if he is also a cigarette smoker. Two factors appear to be involved in carcinogenesis by asbestos: (1) the inherent carcinogenic property of the asbestos fiber, and (2) the defense mechanism by which the macrophages of the lung first isolate the fibers and then fragment them. The fiber will only produce cancer if the protective mechanism is inadequate. The supply of lung macrophages may become exhausted in cases of prolonged exposure to or massive inhalation of asbestos dust. It is possible that a constituent of the smoke, perhaps the tar or an aldehyde, is able to reduce the number of macrophages available for detoxicating the asbestos fibers. Coated chrysotile fibers undergo morphological changes in the lung and fragment sooner than coated crocidolite fibers. The fact that crocidolite fibers persist longer may be one reason why this variety of asbestos is regarded as the most carcinogenic form. Inhaled asbestos fibers can move from the lung to other sites (e.g., thyroid, lymphatics, spleen, abdomen and small intestine). It is concluded that the mobility of asbestos fibers indicates a possibility that tumors might be produced in many parts of the body. (31 references)

4805 ASBESTOS IN POTABLE-WATER SUPPLIES. *(E.)*

Olson, H. L. (Public Water Pipe Div., Johns-Manville Sales Corp., Denver, Colo.). *J Am Water Works Assoc* 66(9):515-518, 1974.

The significance of the presence of asbestos in drinking water due to the increased use of asbestos-cement pipes is discussed. Inhalation or direct feeding of asbestos ducts have failed to produce gastrointestinal (GI) cancer in experimental animals. USPHS records show that the incidence of GI cancer in the US had been declining steadily during a period in which asbestos-cement pipe sales have been increasing. The level of asbestos in water-source samples transported through asbestos-cement pipes is very low and Johns-Manville has developed a procedure for checking the asbestos content of water samples using an electron microscope. In a study of water from nine cities, the fiber content of water flowing through asbestos-cement pipes was 1-6 µg/gallon. The author concludes that there is no indication that water conveyed in asbestos-cement pipes constitutes a health hazard. (No references)

4806 CARCINOGENESIS BY AROMATIC AMINES. *(E.)*

Kriek, E. (Netherlands Cancer Inst., Amsterdam). *Biochim Biophys Acta* 355(2):177-203, 1974.

The purpose of this review is (a) to summarize briefly recent results on the metabolic activation of aromatic amines and the interaction of reactive metabolites with nucleic acids and proteins, (b) to discuss the involvement of aromatic amine residues bound to DNA in mutagenesis and DNA repair processes, and (c) to indicate possible new approaches which may lead to a better understanding of the molecular events involved in the initiation of carcinogenesis by chemicals. The metabolic conversion of *N*-2-acetylaminofluorene (AAF) to active carcinogens is described, although the nature of many ultimate carcinogens appears to remain unknown. Intrinsic factors (age, sex, hormone status, genetics) and exogenous factors (administration of drugs, removal of specific organs and hormone manipulation) which influence carcinogen metabolism are reviewed. The binding of AAF and *N*,*N*-dimethyl-4-aminoazobenzene to protein; AAF and *N*-4-acetylaminobiphenyl-*N*-sulfate to RNA; and AAF to DNA are described. Specific binding sites and stereo configuration of carcinogens bound to RNA and DNA are discussed and intercalation models presented. Mutagenicity of some metabolites is reviewed. The combination of AAF with guanine residues of DNA and subsequent effects of helical stability and DNA repair is considered central to the mechanism by which this compound, typical of many polycyclic amines, exerts its carcinogenic effect. (143 references)

4807 CELL CULTURE STUDIES ON THE MECHANISMS OF HYDROCARBON ONCOGENESIS. *(E.)*

Heidelberger, C. (McArdle Lab. Cancer Res., Univ. Wisconsin, Madison). *Biochem Dis* 4(Part B):457-462, 1974.

Permanent aneuploid contact-inhibited lines of cells derived from adult C3H mouse ventral prostates were developed and used in *in vitro* quantitative studies on hydrocarbon oncogenesis. These prostates had a very low incidence of spontaneous malignant transformation and produced no tumors even when 10^7 cells were inoculated into irradiated C3H mice. There was a good quantitative relationship between the oncogenic activity of a series of polycyclic aromatic hydrocarbons (PAH) and the number of transformed colonies they produced in this system. Moreover, there was no direct relationship between toxicity and transformation. This system was also used to study the metabolism of PAH in these cells, the relationship between oncogenic and mutagenic activities, and the possible existence of cell-surface transplantation antigens in individual transformed clones. PAH, and, to a greater extent, epoxides, bind specifically to a protein called the h-protein (which had been previously partially purified from mouse skin, and to which PAH were specifically and covalently bound in direct relation to their oncogenic activities) in transformable (but not transformed) cells in culture. It is concluded that cell culture systems of chemical oncogenesis represent useful models of *in vivo* oncogenesis and can provide a variety of information relevant to mechanisms that cannot be obtained by experiments in animals. (27 references)

4808 AN INTERMEDIARY MECHANISM IN PULMONARY CARCINOGENESIS. *(Fr.)*

Chrétien, J. (Intercommunal Hosp. Cent., Créteil, France) and M. Thiéblemont. *Nouv Presse Med* 3(21):1347-1349, 1974.

Research on the role of benzopyrene (BP) hydroxylase in the lung is reviewed with respect to the influence of various carcinogens or suspected carcinogens. It has been found in studies on homogenates of rats' lungs that copper, magnesium, zinc, nickel, cobalt, and Fe^{2+} stimulate or inhibit BP hydroxylase activity, depending on their concentrations. Fe^{3+} and Cr^{6+} inhibit it, and arsenic, selenium, and Cr^{3+} have no effect. *In vivo*, BP hydroxylase is inhibited in the hamster by ozone, which appears to act directly on the pulmonary enzyme system. Inhaled NO_2 seems to have no effect. Beryllium inhibits BP hydroxylase in laboratory animals *in vitro*, but not *in vivo* in the rat. Inhaled nickel carbonyl induces pulmonary adenoma in the rat and seems to inhibit BP hydroxylase activity. Cigarette smoke is a strong inducer of BP hydroxylase in both rats and humans. Viral respiratory infections diminish BP hydroxylase activity in the mouse. A purified preparation of interferon stimulates BP hydroxylase activity *in vitro*. The exact role of BP hydroxylase remains in doubt. Although it produces metabolites for excretion which have less carcinogenic effect than the original substrate, it has also been proposed that intermediate metabolites, particularly epoxides, are produced which are more carcinogenic than the original substrate. The cytotoxicity of carcinogenic hydrocarbons is increased *in vitro* by increased BP hydroxylase activity. The capacity to induce the enzyme activity may also be under genetic influence. (24 references)

4809 HORMONAL FACTORS IN MAMMARY CARCINOGENESIS.

(E.) Bulbrook, R. D. (Cancer Res. Fund, London, England). *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:178-187, 1974.

The concept that tumors can be induced in all hormone target organs by hormone manipulation is presented. The relation of estrogens to breast cancer is discussed in the context of pregnancy, and pre- or post-menopausal phases with the overall conclusion that the carcinogenicity of estrogens, both exogenous and endogenous, is highly controversial. Evidence for progesterone and prolactin as potential carcinogens is discussed, the conclusions being generally negative. Hormone-hormone interactions such as estriol-estradiol and androgen-estrogen are considered as being more closely related to carcinogenesis of the breast. Urinary excretion profiles of estriol and estradiol are reviewed, followed by female excretion of androgenic steroids, with the suggestion that certain profiles of steroid hormone excretion can be correlated with breast cancer. It is considered that more etiological factors than steroid hormones are involved in breast cancer and further interdisciplinary research will be required to resolve all these factors. (89 references)

4810 CARCINOGENICITY OF PESTICIDES. *(Pol.)*

Syrowatka, T. (Dep. Sanit. Toxicol., State Dep. Hyg. Warsaw, Poland) and A. Jurek. *Rocz Panstw Zakl Hig* 25(5):563-576, 1974.

Based on the findings and recommendations of the U.S. Commission on Pesticides and Their Relationship to Environmental Health, Dec. 1969, the various aspects of testing for carcinogenicity are reviewed. Guidelines for biological testing (such as the number, strain and sex of animals, length of observation, classification of resulting tumors, exact data on the compounds administered) are discussed and the results are interpreted. Pesticides have been classified into several groups according to their carcinogenicity in animals. Group A contains pesticides which were "nonpositive" in two animal species and are registered and used for agricultural crops. This group consists of chlorpropham, rotenone and carbaryl. Group B consists of pesticides which gave positive results on one or more animal species at a 0.01 significance level. It contains aldrin, aramite, chlorobenzilate, DDT, dieldrin, mirex, strobane and heptachlor; those not used on agricultural crops are amitrole, di-allate, dichloroethyl ether, N-(?-hydroxyethyl) hydrazine and PCNB. Group C consists of pesticides for which the data are insufficient for definite evaluation and for which more research is needed. This group is subdivided according to the necessity for further studies. Group C_1 includes p,p'-DDD, monuron, perthane, piperonyl butoxide and piperonyl sulfoxide; those not used for agricultural crops are azobenzene, chlormequat chloride, chloranil, cyanamide, vancide BL and mexacarbate. Group C_2 consists of biphenyl, captan, dichloran, captax, gibberellic acid and ovex; those not used in agriculture are Genite-R99 and propham. Group C_3 consists of dichlorprop, 2,4-D isopropyl ester, propyl isome, pyrethrins and zineb; those not used for agricultural crops are α-napthylacetamide and 2(2,4,5-trichlorophenoxy)propionic acid. Group C_4 consists of atrazine, botran, butacide, 2,4-D, dichlone, diuron, *o*-phenylphenonl, endosulfan, ferbam, folpet, glyodin, maneb, methoxychlor, ziram, nabam, phenothiazine, Planofix NAA, propazine, simazine, tetradifon, thiram, eptam, the butyl and iso-octylesters of 2,4-D, anhydrous acetic acid and maleic hydrazide. (12 references)

4811 THYROID CANCER. *(E.)*

Doniach, I. (Dep. Morbid Anat., London Hosp., England). *Proc R Soc Med* 67(11):1103-1104, 1974.

The incidence of thyroid cancer in humans under fifty years of age, whose thyroids have been exposed to ionizing irradiation, is reviewed. The age cutoff is used because spontaneous thyroid cancer usually occurs in late middle age. Two main groups are considered, those receiving irradiation to the head and neck for non-malignant conditions (^{131}I for hyperthyroidism) and survivors from exposure to nuclear bomb explosion and radioactivity from dust fallout. Increased risk of thyroid cancer is demonstrated in these groups, particularly in children under ten yr and in the group exposed to nuclear bomb radioactivity. (9 references)

4812 THE CELLULAR AND MOLECULAR BIOLOGY OF RNA TUMOR VIRUSES, ESPECIALLY AVIAN LEUKOSIS-SARCOMA VIRUSES, AND THEIR RELATIVES. *(E.)*

Temin, H. M. (McArdle Lab., Univ. Wisconsin, Madison). *Adv Cancer Res* 19:47-104, 1974.

RNA tumor viruses are medium-sized animal viruses with an RNA genome in the virion. Virus replication involves a DNA intermediate and the virions contain a DNA polymerase. Rnadnaviruses include avian leukosis-sarcoma virus, mammalian C-type rnadnavirus, viper C-type rnadnavirus, mouse mammary tumor virus, Mason-Pfizer monkey virus, Visna virus, synctium-forming virus, reticuloendotheliosis virus, and particles related to rnadnaviruses. Virions of all rnadnaviruses are medium-sized, roughly spherical and have a lipid-containing envelope with two external glycoproteins. Inside the lipid envelope are 3-5 major proteins, a DNA polymerase, and RNA. Evidence for a DNA intermediate in the replication of Rous sarcoma virus (RSV), and for all RNA tumor viruses and rnadnaviruses as proposed in the provirus hypothesis, is now quite strong. Sequences homologous to much of the RSV genome are present in DNA of RSV-infected cells and sequences homologous to a smaller fraction of the RSV genome are present in the DNA of uninfected chicken cells. It appears most likely that the DNA provirus is synthesized by the virion DNA polymerase with viral RNA as a template and primer. Evidence includes the formation of provirus in the presence of cycloheximide, absence of DNA polymerase activity in certain noninfectious RSV and MSV virions, correlation of inactivation of infectivity and DNA polymerase activity after pretreatment of virions with inhibitors, and the existence of two temperature-sensitive RSV mutants with temperature-sensitive DNA polymerase activity. Most neoplasias are not associated with the presence of overt infection by a rnadnavirus. The oncogene hypothesis states that the entire genome of a strongly transforming rnadnavirus is present in all cells and that its activation leads to neoplasia. Hypothesis 3b of Temin suggests that RNA tumor viruses provide only an analogy for most neoplastic transformation; carcinogenesis involves the formation in cells of genes for neoplastic transformation by RNA-directed DNA synthesis. (318 references)

4813 ON THE ORIGIN OF RNA TUMOR VIRUSES. *(E.)* Temin, H. M. (McArdle Lab. Cancer Res., Univ. Wisconsin, Madison). *Annu Rev Genet* 8:155-177, 1974.

The relationship of representative RNA tumor viruses to each other and to uninfected cells is presented with the suggestion that RNA tumor viruses repeatedly evolved from a normal cellular genetic system important in differentiation and evolution. Replication of RNA tumor viruses involves entrance into cells, formation of DNA provirus, integration, activation of transcription, transcription of viral RNA, translation and assembly. In productive infections, the sensitive cells may be transformed or killed, or may manifest no effects of the virus infection. Genomes of defective viruses may infect permissive cells as a result of phenotypic mixing with a nondefective helper virus. Members of a group of ribodeoxyviruses have approximately two-thirds of nucleic acid sequences in common; little or no inter-group nucleic acid sequence homology has been reported. Only ribodeoxyviruses are known to use RNA to DNA information transfer and only ribodeoxyviruses have genes related to specific cellular genes and products. The protovirus hypothesis states that cells of ancestral organisms had a genetic system for DNA to RNA to DNA information transfer; protovirus hypothesis predicts amino acid sequence homologies between viral structural proteins and cellular proteins. (100 references)

4814 HERPES VIRUSES AND CANCER. *(E.)* Rapp, F. (Coll. Med., Pennsylvania State Univ., Hershey). *Adv Cancer Res* 19:265-302, 1974.

The emphasis of this review is placed on the potential rather than the proven properties of herpesviruses (HV) as carcinogenic agents in human cancer. Parallels are drawn from HV onocgenesis in animals and the association of Epstein-Barr virus (EBV) with Burkitt's lymphoma and herpes simplex virus with human cervical cancer. Characteristics of human herpesviruses are described including replication processes, induction of EBV, and the occult (latency) properties of herpes simplex types I and II. The *in vitro* transforming ability of EBV, herpes simplex and cytomegalovirus for human and non-human target cells, and their genetic expression in these cells are considered. Immunological studies on herpesvirus-transformed hamster cells that become oncogenic *in vivo* are cited as a model for the same process that might occur in human cancer. Hypothetical extrapolations from animal studies are made that might uncover the role of herpes viruses in human disease and lead to effective vaccination. (183 references)

4815 COMPARISON OF GENOME REPLICATION MECHANISMS OF ONCOGENIC DNA VIRUSES. *(E.)* Bourgaux, P. (No affiliation). In: *Viruses, Evolution and Cancer: Basic Considerations* edited by E. Kurstak and K. Maramorosch (New York, Academic Press, 1974), pp. 119-149.

The physical characteristics and replicative mechanisms for two categories of oncogenic simian virus 40 viral DNA, the papovaviruses and adenoviruses are reviewed. The various complex structural forms of intact polyoma virus DNA are described followed by data from studies on replication of DNA intermediates. Similar data is cited for simian virus 40 DNA. The origins and direction of replication, mechanisms for chain elongation, physical state of template chains in replicating molecules and the replicating cycle for polyoma viruses are reviewed. Similar studies and results are presented for adenoviruses. Differences in replication mechanisms between PV and AV are cited. While the replication mechanisms appear similar for simian virus 40 DNA and polyoma virus DNA, adenovirus DNA replication seems to follow a different pattern. Further research is indicated to determine whether it will be possible to reconcile the structural features of some intracellular forms of these DNA's with their known common oncogenic properties. (90 references

4816 GENETIC ASPECTS OF ROUS SARCOMA VIRUS INFECTION. *(E.)* Hanafusa, H. (Dep. Viral Oncol., Public Health Res. Inst. City New York, N.Y.), S. Kawai, T. Hanafusa, C. M. Scheele and C. Metroka. *Collect Pap Annu Symp Fundam Cancer Res* 25:206-215, 1974.

The genetic analysis of Rous sarcoma virus (RSV) infection aims at elucidation of the mechanism of cell transformation. Defective functions of Bryan RSV are reviewed and recent studies of Schmidt-Ruppin RSV mutants which are temperature sensitive in cell transformation are described. In addition to the infectious helper virus previously known to be essential to replication of Bryan RSV, another helper, unable to mature into infectious helper virus by itself, is contributed by normal chicken cells. This chick cell-associated helper factor (chf) is genetically controlled, and every cell from a single embryo is equally either positive or negative for chf. Positive cells produce infectious virus, RSV(f), while negative cells produce only noninfectious virus, RSV(-). SDA-gel electrophoretic analysis showed that Bryan RSV possesses multiple envelope glycoprotein moieties, while leukosis or helper independent sarcoma viruses contain a single moiety with low electrophoretic mobility. This slow glycoprotein was absent from Bryan RSV(-). The work thus provided physical evidence for defectiveness. In the studies on Schmidt-Ruppin RSV temperature-sensitive mutants, which cause cells to be reversibly transformed at 37 C and reversibly return transformed cells to normal at 41 C, complementation analyses were carried out whereby tests were made for properties of recombinants obtained by means of mixed infection with SR-RSV (subgroup A) and RAV-2 (subgroup B). The mixed infection produced SR-RSV with subgroup B specificity. Using the same procedure, three temperature-sensitive mutants were converted from subgroup A to B, maintaining the temperature-sensitivity. Results obtained with different combinations of the mutants suggested that virus may have more than two cistrons for temperature-sensitive proteins essential for cell transformation, that the protein consists of two subunits, or that the two temperature-sensitive components could be the same subunit of an enzyme, which is composed of more than two molecules of the subunit, with a disorder of amino acid sequence at different locations. (28 references)

4817 GENETICS OF DNA TUMOR VIRUSES. *(E.)* Echart, W. (Salk Inst., San Diego, Calif.). *Ann Rev Genet* 8:301-307, 1974.

The genetic properties of polyoma virus and simian virus (SV40), obtained largely by study of viral mutants and other mapping techniques are reviewed. It is suggested that knowledge of the genes of these transforming oncogenic viruses may help to pinpoint the mechanism of carcinogenesis, at least viral carcinogenesis. The review is presented under the following headings: infection and transformation by polyoma viruses and SV40, temperature-sensitive (ts) mutants of polyoma and SV40, host range mutants, deletion mutants, hybrid viruses, tsA mutants of polyoma and SV40, ts101 mutant of SV40, and late mutants of polyoma and SV40. The involvement of viral genes in transformation is discussed with particular evidence from ts viral transformation. The relationship of viruses to cell growth control is considered as only one of many factors in this complex process. (90 references)

4818 IMMUNITY, EMOTIONS AND STRESS: WITH SPECIAL REFERENCE TO THE MECHANISMS OF STRESS EFFECTS ON THE IMMUNE SYSTEM. *(E.)* Solomon, G. F. (Stanford Univ. Sch. Med., Calif.), A. A. Amkraut and P. Kasper. *Ann Clin Res* 6(6):313-322, 1974.

The effects of stress and emotional distress on the functioning of the immunologic system and the development of cancer and autoimmune diseases are reviewed. Evidence from a variety of sources suggests that stress and emotional distress may relate to dysfunction and hypofunction of the immunologic system. Some forms of stress reduce primary and secondary antibody responses to low-dose antigen stimulation in rats, and adult immunologic responsivity may be altered by early infantile experience. Mixed-sex group housing at high male:female ratios increases the severity of adjuvant-induced arthritis in the male rat and graft-*versus*-host (GVH) reactions are diminished by food-limitation stress in recipient animals. Sex-segregated group-housed mice show larger murine virus-induced sarcomas when inoculated at six and nine months of age than males housed individually with two or more females. Electric shock stress for three days prior to inoculation with virus reduces the incidence and size of murine sarcoma virus tumors, while shock administered three days following inoculation increases tumor size. Female mice which develop spontaneous fighting behavior show significantly greater resistance to Moloney murine sarcoma-virus tumors. Acutely ill schizophrenic patients with relatively high levels of IgA and IgG have a poorer short-term prognosis and electrolytic lesions of the ventromedial and posterior nuclei of the hypothalamus of recipient and possibly donor animals impair the GVH reaction. Stress and central nervous system lesions also appear to affect thymus-derived lymphocytes and play a role in cell-cell interaction or the release of mediators from reacting lymphocytes. Future studies may indicate that stress affects the macrophase, a hormone-sensitive cell which plays a role in afferent, central and efferent limbs of the immune system. (51 references)

4819 LIGAND-INDUCED REDISTRIBUTION OF MEMBRANE MACROMOLECULES: SOME POSSIBLE IMPLICATIONS FOR CANCER. *(E.)* Raff, M. C. (Med. Res. Council Neuroimmunol. Project, U. Coll., London, England) and S. de Petris. *J Clin Pathol [Suppl]* 27(7):31-34, 1974.

Evidence supporting the "fluid mosaic" model of the cell membrane comes from the observation that when multivalent or divalent antibodies or ligands interact with macromolecules on the surface of living cells, the macromolecules undergo a dramatic redistribution in the plane of the membrane. This ligand-induced redistribution may take the form of patching, capping or pinocytosis. The clustering of Concanavalin A (Con A)-binding sites on the surface of simian virus 40-transformed and trypsinized 3T3 cells is likely induced by the binding of the multivalent Con A-ferritin. However, no difference has yet been found in the redistribution of Con A receptor sites induced by the binding of Con A-ferritin to agglutinable and nonagglutinable cells. Despite the fact that most cancer cells express new tumor-specific antigens on their surface against which the host usually makes immunological responses, tumors frequently continue to grow and kill the animal. The production of circulating "blocking" or "enhancing" factors in the form of antibody, antigen, or antibody-antigen complexes which specifically interfere with the host's tumor-destroying immune responses might account for this paradox. Blocking factors could operate either at the level of the tumor cell or at the level of immunocompetent lymphocytes, and if antibody is involved, either alone or complexed with antigen, these effects are referred to as peripheral or central enhancement, resp. The potential importance of antibody-antigen complexes as "blocking factors" and the ratio of antibody to antigen in such complexes may reflect the importance of ligand valency in their ability to redistribute membrane macromolecules. (34 references)

4820 TUMOR-SPECIFIC ANTIGENS AND REEXPRESSION OF FETAL ANTIGENS IN MAMMALIAN CELLS.

(E.) Lausch, R. N. (Milton S. Hershey Med. Cent., Pennsylvania State Univ., Hershey) and F. Rapp. *Prog Exp Tumor Res* 19:45-58, 1974.

The relationship between fetal antigens and tumor cell surface antigens in oncogenic viral systems of animals and also to chemical carcinogen-induced animal tumors is reviewed. Tumor-associated membrane antigens (TSA) are first defined and mechanisms proposed for transformation of the normal membrane to express TSA. The possibility that simian virus 40 is a derepressed fetal antigen is discussed with presentation of evidence, both positive and negative, for this hypothesis. Evidence for the theory that the cross-reactivity of chemical carcinogen-induced tumors is due, in part, to the presence of derepressed fetal antigens is discussed. It is concluded that fetal antigens, while present on tumor cell surfaces, are distinct from TSA and immunotherapy through immunization with fetal antigens would not appear to be advantageous. Reexpression of fetal antigens in cancer is, however, a useful tool in determining the origins of TSA. (39 references)

4821 SIGNIFICANCE OF PARAPROTEINS IN NEOPLASTIC DISEASE.

(E.) Jerry, L. M. (Victoria Hosp., McGill Univ., Montreal, Canada). *Prog Exp Tumor Res* 19:59-90, 1974.

The structure of normal immunoglobulins (Ig), the origins of abnormal quantities of serum Ig in disease (mostly lymphoid cancer), the diagnostic value of serum Ig and a brief description of surface receptor Ig of lymphocytes are reviewed. The secondary structure of the various human Ig, the separation of function (antigenic, effector) within the immunoglobulin molecular aggregate, gene origins and the intracellular assembly of normal Ig chains is described. The appearance of serum paraproteins long before any clinical manifestations of related diseases such as myeloma is discussed in relation to prognosis of paraproteinemia and the eventual incidence of malignant disease. Evidence for the one-cell (monoclonal) origin of paraproteins in murine plasma cell tumors is presented and their relation to plasma cell disorders, myelomas, amyloidosis, heavy chain disease, macroglobulinemia and other diseases, is reviewed. Transient paraproteinemias caused by drug reactions, infections and certain surgery are also noted. The significance of paraproteins as Ig fragments resulting from misassembly rather than fragmentation of the intact molecule is pointed out. Reactivity, both as antibody and nonspecific complexing, between paraproteins and normal serum proteins to produce pathologic conditions such as amyloidosis and renal disorders is listed. (153 references)

4822 DIAGNOSTIC AND PROGNOSTIC VALUE OF CHROMOSOME STUDIES IN CANCER.

(E.) Nowell, P. C. (Sch. Med., U. Pennsylvania, Philadelphia). *Ann Clin Lab Sci* 4(4):234-240, 1974.

Chromosome studies may be of value in determining the diagnosis or prognosis in leukemia and related states. They are rarely helpful with solid neoplasms. Special technical problems associated with such investigations in tumor material must be appreciated. In cases where the diagnosis of acute leukemia is in doubt, demonstration of a chromosome change in the immature cells of blood or marrow is strong evidence of neoplasia; however, the absence of cytogenetic abnormality does not rule out the diagnosis. The Philadelphia chromosome (Ph) is present in nearly every typical case of chronic granulocytic leukemia (CGL) and may confirm the diagnosis. Absence of the Ph chromosome in CGL or the appearance of additional cytogenetic changes in the neoplastic cells are indications of a poor prognosis. In "preleukemic" myeloproliferative disorders (except polycythemia vera) or unexplained pancytopenia, a clone of chromosomally abnormal marrow cells commonly indicates that clinical leukemia will soon become manifest; conversely, normal marrow chromosomes in these states are often correlated with a prolonged indolent course. Chromosome studies have generally not been of diagnostic or prognostic value in chronic lymphocytic leukemia (CLL) because of the difficulty in obtaining dividing neoplastic cells. As the immunological characteristics of various lymphoproliferative disorders, lymphoma as well as leukemia, are better identified with respect to their B or T characteristics, and as more efficient B cell mitogens are discovered, it should be possible to obtain adequate numbers of dividing cells and thus use cytogenetic studies more effectively in evaluating difficult diagnostic problems. (5 references)

4823 AN OUTLINE OF THE OBJECTIVES OF THE STUDY OF LEUKAEMIC CELL KINETICS.

(E.) Gavosto, F. (Gen. Med. Clin., Univ. Turin, Italy). *Bibl Haematol* 39:968-977, 1973.

Better understanding of growth models of leukemic cell populations may be of assistance in chemotherapy of the disease by relating antileukemic drugs to different stages of the cell cycle. Cyclic models assume the existence of a significant cell fraction in the mitotic resting stage (G_0) capable of reentry into the cycle as a result of normal evolution and administration of therapy. Proliferative potential of an acute leukemia blast is probably a function of its age. In addition to the synchronous return to the cycle of stem cells in G_0 before effective chemical destruction, theory suggests the possibility of sealing off cells in G_0 so that they are prevented from returning to the cycle and will die of old age. Cellular stages preceding the clinical picture have a different kinetic pattern from the clinical phase; doubling and cycling times are shorter and GF values are higher. Growth potential of such cells declines after serialized transplants and they can be influenced by proliferation and differentiation-regulating factors. A committed stem cell line is only able to produce clones which consist of well-differentiated progeny;

pluripotential stem cells are associated with extensive proliferation and various lines of differentiation. Environment has an influence on differentiative properties of hemopoietic cells as well as on mitotic activity; low degree of differentiation of some leukemic cells may be due to the simultaneous existence of two distinct stem cell populations, one normal and one leukemic. (18 references)

4824 CYCLIC AMP AND CELLULAR TRANSFORMATION. *(E.)* Johnson, G. S. (Natl. Cancer Inst., Bethesda, Md.). *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* 89-96, 1973.

The possibility that cyclic AMP acts as a central control locus in the cell and is involved in the alterations caused by transformation is reviewed. Cellular properties influenced by cyclic AMP are morphology, adhesion to substratum, cell motion, logarithmic growth rate, saturation density, growth in soft agar, acid mucopolysaccharide synthesis, collagen synthesis, tumor growth, virus production and viral transformation, transport, cell membrane composition, agglutination by plant lectins, and synthesis of cyclic AMP phosphodiesterase. Other properties are not influenced when cyclic AMP is added to the growth medium. The initial event in transformation leads to a decrease in adenylate cyclase activity, which causes the cyclic AMP levels to fall, and the cellular properties influenced by cyclic AMP are altered. The addition of cyclic AMP analogs tends to restore these properties to normal. Other abnormal properties are not corrected by cyclic AMP; they may be the result of the initial transformation event unrelated to the decrease in adenylate cyclase activity. Low levels of cyclic AMP are responsible for some but not all abnormal properties of transformed cells. (23 references)

4825 ENZYMATIC AND METABOLIC ALTERATIONS IN EXPERIMENTAL HEPATOMAS. *(E.)* Weinhouse, S. (Temple Univ. Sch. Med., Philadelphia, Pa.). *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* 187-201, 1973.

Studies of enzyme activities and isoenzyme composition in Morris hepatomas are reviewed. In the highly differentiated, slow-growing hepatomas the sole or preponderant isozymes are the so-called liver marker types: glucokinase, aldolase B, pyruvate kinase L, and the liver-type glycogen phosphorylase. With decreased differentiation and increased growth rate, these liver types decrease markedly; in the fast-growing, poorly differentiated hepatomas, the liver-type isozymes are nearly or completely replaced by high activities of nonhepatic type isozymes. The slow-growing, well-differentiated hepatomas utilize glucose poorly and have a low rate of aerobic glycolysis; but they utilize fatty acids as respiratory fuel as does normal adult liver. The fast-growing, poorly differentiated hepatomas have largely lost the ability to oxidize fatty acids, but have a high aerobic glycolysis and utilize glucose as a respiratory fuel. Evidence from experiments in model systems points to the high levels of pyruvate kinase as a determining factor in the high aerobic glycolysis in the poorly differentiated hepatomas. It is suggested that the replacement of isozymes geared for organ function by isozymes that are geared primarily for efficient utilization of metabolites and that are not under host dietary or endocrine control represents a molecular basis for the uncontrolled proliferation of cancer cells. It is concluded that the isozyme data support and add functional significance to the evidence for an anomaly of gene expression in cancer, whereby certain genes that code for proteins in normal adult tissue are switched off and genes that are normally active are switched on. (49 references)

4826 THE PHYSIOPATHOLOGY OF CANCER. VOL. 1. BIOLOGY AND BIOCHEMISTRY. *(E.)* Edited by P. Shubik (No affiliation) and F. Homburger. Basel, Switzerland, S. Karger, 1974, 403 pp.

4827 IARC MONOGRAPHS ON THE EVALUATION OF THE CARCINOGENIC RISK OF CHEMICALS TO MAN. VOL. 1. *(E.)* Anonymous. *Food Cosmet Toxicol* 12(2):243-244, 1974. (No references)

4828 IARC MONOGRAPHS ON THE EVALUATION OF THE CARCINOGENIC RISK OF CHEMICALS TO MAN. SOME INORGANIC AND ORGANOMETALLIC COMPOUNDS. VOL. 2. *(E.)* Anonymous. *Food Cosmet Toxicol* 12(2):244-245, 1974. (No references)

4829 PATHOLOGICAL AND ENVIRONMENTAL ASPECTS OF ASBESTOS-ASSOCIATED DISEASES. *(E.)* Jones, J. S. P. (City Hosp., Nottingham, England). *Med Sci Law* 14(3):152-158, 1974. (28 references)

4830 LUNG DISEASE RELATED TO EXPOSURE TO ASBESTOS. *(E.)* Hughes, D. T. D. (London Hosp., England). *Med Sci Law* 14(3):147-151, 1974.

4831 THE ROLE OF ASBESTOS EXPOSURE IN THE ETIOLOGY OF PLEURAL MESOTHELIOMA. *(Fr.)* Turiaf, J. (Bichat Hosp., Paris, France) and J. P. Battesti. *Vie Med Can Fr* 3(7):653-659, 1974.

4832 MOLECULES IN FOOD THAT ALTER DRUG METABOLISM. *(E.)* McLean, A. E. M. (Univ. Coll. Hosp. Med. Sch., London, England). *Proc Nutr Soc* 33(3):197-202, 1974. (33 references)

4833 ZEARALENONE IN THE DIET, PODOPHYLLOTOXIN IN THE WOOD SHAVINGS BEDDING, ARE LIKELY TO AFFECT THE INCIDENCE OF "SPONTANEOUS" TUMOURS AMONG LABORATORY ANIMALS. *(E.)* Schoental, R. (R. Vet. Coll., London, England). *Br J Cancer* 30(2):181, 1974. (2 references)

4834 THE ETIOLOGY OF HUMAN BREAST CANCER: ENDOCRINE, GENETIC, VIRAL, IMMUNOLOGIC AND OTHER CONSIDERATIONS. *(E.)* Papaioannou, A. N. (No affiliation). New York: Springer-Verlag, 1974, 199 pp. (1429 references)

4835 INTRAUTERINE INDUCTION OF CANCER BY THE EXPERIMENTAL APPLICATION OF CHEMICAL SUBSTANCES. *(E.)* Ivankovic, S. (No affiliation). *Recent Results Cancer Res* 44:16-20, 1974. (23 references)

4836 VIRUSES AND CANCER. *(It.)* Tarro, G. (1st Fac. Med. Surg., Univ. Naples, Italy). *Clin Eur* 13(1):4-9, 1974. (20 references)

4837 THE SEARCH FOR HUMAN TUMOR VIRUSES. *(E.)* Sinkovics, J. G. (Univ. Texas M. D. Anderson Hosp. Tumor Inst., Houston). *Collect Pap Annu Symp Fundam Cancer Res* 25:499-516, 1974. (111 references)

4838 VIRUS-INDUCED DISEASES OF THE BLOOD. *(Ger.)* zur Hausen, H. (Inst. Clin. Virol., Univ. Erlangen, Germany). *Med Welt* 25(40):1581-1584, 1974. (No references)

4839 INDUCING AGENTS OF MURINE LEUKEMIA. *(E.)* Pasqualini, C. D. (Natl. Acad. Med., Buenos Aires, Argentina). *Medicina (B Aires)* 34(1):55-57, 1974. (7 references)

4840 DETECTION, CHARACTERIZATION AND DISTRIBUTION OF THE POSSIBLE ETIOLOGIC AGENT OF BOVINE LEUKEMIA. *(E.)* Ferrer, J. F. (Univ. Pennsylvania, New Bolton Cent.). *Medicina (B Aires)* 34(1): 62-63, 1974. (No references)

4841 MOLECULAR BIOLOGY OF THE ADENO-ASSOCIATED VIRUSES. *(E.)* Berns, K. I. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Curr Top Microbiol Immunol* 65:1-20, 1974. (64 references)

4842 IMMUNE PHENOMENA IN LYMPHOPROLIFERATIVE DISEASES. *(Ger.)* Baenkler, H. W. (Univ. Hosp., Erlangen, Germany). *Med Welt* 25(40):1584-1589, 1974. (No references)

4843 ACUTE LEUKEMIA IN THE TERMINAL STAGE OF HODGKIN'S DISEASE: A RESULT OF CELLULAR IMMUNE DEFICIENCY? *(Ger.)* Tittor, W. (Med. Clin., Univ. Heidelberg, West Germany), P. Drings and H. Fritsch. *Therapiewoche* 24(50):5962, 5964, 5967, 1974. (4 references)

4844 IMMUNOLOGY AND INTESTINAL CANCER. *(Fr.)* Martin, F. (Fac. Med., Dijon, France). *Biol Gastroenterol (Paris)* 7:245-248, 1974. (7 references)

4845 SERUM FACTORS AND CELL-MEDIATED DESTRUCTION OF TUMOR CELLS. *(E.)* Pllack, S. (Univ. Washington Med. Sch., Seattle). In: *Developmental Aspects of Carcinogenesis and Immunity* edited by T. J. King (New York: Academic Press Inc., 1974), pp. 187-203. (63 references)

4846 MACROPHAGES VERSUS TUMORS. *(Fr.)* Cesarini, J. P. (No affiliation), M. de Meuron-Landolt. *Recherche* 5(44):384-386, 1974. (No reference

4847 DEVELOPMENT AND DIFFERENTIATION OF LYMPHOCYTES. *(E.)* Raff, M. C. (Zool. Dep., Univ. Coll. London, England). In: *Developmental Aspects of Carcinogenesis and Immunity* edited by T. J. King (New York: Academic Press Inc., 1974), pp. 161-172. (43 references)

4848 LYMPHOCYTE DIFFERENTIATION AND IMMUNE SURVEILLANCE AGAINST CANCER. *(E.)* Nossal, G. J. V. (Walter-Eliza Hall Inst. Med. Res., Melbourne, Australia). In: *Developmental Aspects of Carcinogenesis and Immunity* edited by T. J. King (New York: Academic Press Inc., 1974), pp. 205-213. (17 references)

4849 IMMUNOLOGICAL SURVEILLANCE AND ITS SIGNIFICANCE IN PATHOLOGY. *(Rum.)* Simu, G. (Inst Oncol., Cluj, Rumania). *Clujul Med* 47(2):419-424, 1974. (16 references)

4850 EMBRYONIC AND FETAL ANTIGENS IN CANCER CELLS. *(E.)* Coggin, Jr., J. H. (Univ. Tennessee, Dep. Microbiol., Knoxville) and N. G. Anderson. In: *Developmental Aspects of Carcinogenesis and Immunity* edited by T. J. King (New York: Academic Press Inc., 1974), pp. 173-185. (45 references)

4851 EMBRYONIC ANTIGENS FOR GASTROINTESTINAL TUMORS: THEIR CLINICAL SIGNIFICANCE. *(Rum.)* Belascu, M. (Reg. Hosp., Bistritsa, Rumania) *Clujul Med* 47(2):435-442, 1974. (37 references)

4852 THE HISTOPATHOLOGY AND HISTOGENESIS OF HODGKIN'S DISEASE. *(Fr.)* Belpomme, D. (Paul Brousse Hosp., Villejuif, France), H. Rappapor and G. Mathe. *Rev Prat* 24(45):3911-3926, 1974. (7 references)

4853 THE HISTOLOGY AND HISTOGENESIS OF EARLY GASTRIC CARCINOMA. *(Ger.)* Grundmann, E. (Pathol. Inst., Univ. Munster/Westphalia, West Germany). *Therapiewoche* 24(36):3824, 3827-3828, 3831, 1974. (22 references)

4854 PRECANCER OF THE LARGE INTESTINE. *(Ger.)* Otto, P. (Med. Coll., Hannover, West Germany). *Verh Dtsch Ges Inn Med* 80:319-323, 1974. (30 references)

4855 EVOLUTION OF CANCER OF THE COLON AND RECT *(E.)* Morson, B. C. (St. Mark's Hosp., Lo don, England). *Proc Inst Med Chic* 30(4):145-148, 1974. (12 references)

4856 CANCER IN ULCERATIVE COLITIS. *(E.)* Morson, B. C. (St. Mark's Hosp., London, England). *Arch Fr Mal App Dig* 63(7):581-583, 1974. (references)

HUMAN AND ANIMAL CANCER, EXTRAPOLATION
PRINCIPLES. *(E.)* Tulinius, H. (Int.
cy Res. Cancer, Lyon, France). *Medicina (B
s)* 34(1):35-36, 1974. (No references)

EFFECT OF URBAN LIVING ON THE RESPIRATORY
TRACT OF THE POPULATION. *(Fr.)* Freour,
No affiliation). *Vie Med Can Fr* 3(2):162-178,
.

ZOONOSIS AND ITS POSSIBLE RELATION WITH
LYMPHOMA AND LEUKEMIA IN MAN: GENERAL
EPTS. *(E.)* Pavlovsky, A. (Natl. Acad. Med.,
os Aires, Argentina). *Medicina (B Aires)* 34(1):
0, 1974. (7 references)

ZOONOSIS AND ITS POSSIBLE RELATION WITH
LYMPHOMA AND LEUKEMIA IN MAN: BACKGROUND
RMATION. *(E.)* Pasqualine, C. D. (Natl. Acad.
, Buenos Aires, Argentina) and C. Caparo. *Medi-*
(B Aires) 34(1):1-18, 1974. (122 references)

EPIDEMIOLOGY OF HUMAN LYMPHOMAS. *(E.)*
Davies, J. N. P. (Albany Med. Coll., N.Y.).
cina (B Aires) 34(1):21-29, 1974. (21 references)

4862 GEOGRAPHIC PATHOLOGY OF LYMPHOMAS IN LATIN AMERICA. *(E.)* Besuschio, S. C. (Natl. Acad. Med., Buenos Aires, Argentina). *Medicina (B Aires)* 34(1):30-31, 1974. (No references)

4863 GENETIC ASPECTS OF TUMORIGENESIS. *(Ger.)* Schroeder, T. M. (Inst. Anthropol. Hum. Genetics, Univ. Heidelberg, West Germany). *Verh Dtsch Ges Inn Med* 80:1016-1022, 1974. (14 references)

4864 A SHORT HISTORY OF HeLa CELLS. *(Fr.)* Passage, E. (No affiliation). *Recherche* 5(49):886-888, 1974. (5 references)

4865 CYTOGENETIC STUDIES OF HUMAN LYMPHOBLASTOID CELL LINES. *(E.)* de Salum, S. B. (Natl. Acad. Med., Buenos Aires, Argentina). *Medicina (B Aires)* 34(1):42-43, 1974. (No references)

4866 DEVELOPMENT OF MUTATIONAL MODEL SYSTEMS FOR STUDY OF CARCINOGENESIS. *(E.)* Malling, H. V. (Natl. Inst. Environ. Health Sci., Research Triangle Park, N.C.) and E. H. Y. Chu. *Biochem Dis* 4(Part B):729-746, 1974.

Mutational model systems currently being developed and used to study the carcinogenic properties of various substances are discussed. Such systems may be used: 1) to identify genetic events which are most likely to result in tumors or; 2) to prescreen chemicals for mutagenic activity in an attempt to predict carcinogenic activity. Three different systems have been used to prescreen carcinogens: 1) forward mutation of cultured Chinese hamster V79 cells from azaguanine sensitivity to resistance as well as reversion from resistance to sensitivity; 2) forward mutations of heterokaryotic conidia of *Neurospora crassa* in the adenine-3 region; and 3) reversion of histidine-requiring mutants of *Salmonella typhimurium*. Studies with a series of carcinogenic and non-carcinogenic polycyclic hydrocarbons as well as with 2-acetylaminofluorene and its metabolites indicate that only the reactive metabolites of the carcinogens are mutagenic in cultured Chinese hamster and *Neurospora crassa* cells. This is not the case in the *Salmonella* system in which 2-aminofluorene can induce reverse mutations. Heterologous host-mediated assays use *Neurospora* or *Salmonella* as indicator organisms which are injected into the animal prior to treatment with the substance in question. Because of foreign body reactions of the host to the indicator organism, this assay cannot be used to test the effects of chronic carcinogen treatment. The host may also induce mutations in some indicator organisms which are unrelated to any effects of the carcinogen.

4867 ENVIRONMENTAL MUTAGEN TESTING IN *ESCHERICHIA COLI* AND PHAGE LAMBDA. *(E.)* Kondo, S. (Fac. Med., Osaka Univ., Osaka, Japan). *Mutat Res* 26(4):235-241, 1974.

A biological classification of induced mutagenesis is proposed based not on chemical specificities of mutagens, but on the involved biological factors such as DNA repair systems. This method supplements the classification of chemical mutagens by chemical specificity for inducing reversions differentially among a set of specified frameshift mutants. Differential reversibilities by eight popular mutagens of a set of four strains with the same *amber* nonsense marker, but different DNA repair capacities (*wild type*, $uvrA^{-}$, $polA^{-}$, $recA^{-}$) lead to the following classification: (1) mutagenesis by *recA*-dependent misrepair of (i) excisable DNA damage (UV, 4-nitroquinoline-1-oxide), (ii) unexcisable DNA damage (x-rays, methyl methanesulfonate), or (iii) excision-repair induced DNA damage (mitomycin C); and (2) *recA*-independent misreplication mutagenesis (*N*-methyl-*N*'-nitro-*N*-nitrosoguanidine, ethyl methanesulfonate, hydroxylamine). The model that explains that the *recA*-independent mutagenesis is, at least partly, due to mutagen-induced damage to the replication machinery is supported by induction of mutation in phage λ after infection of *N*-methyl-*N*'-nitro-*N*-nitrosoguanidine-pretreated host bacteria of either a $recA^{+}$ or $recA^{-}$ strain.

4868 A BIOLOGICAL AGENT ISOLATED BY TRANSFORMATION. *(E.)* Nishioka, K. (Osaka Univ. Med. Sch., Japan). *Med J Osaka Univ* 24(4):281-291, 1974.

A biological agent designated 2n-agent was activated by x-ray irradiation (3.5 Kr) of a cell line [2nE (G$_1$)] derived from an Ehrlich ascites tumor. Though the activity of the agent persisted over a long period in the abdominal cavities of male DDO mice, the animals sustained relatively little damage and resisted a lethal i.p. injection of the agent. However, malignant tumors grew in about 20% of immune mice injected with a large quantity of agent. Among cells transformed in this way, eight lines induced microbiological agents (i.e., 2n-agents) as a result of x-ray irradiation, while four other lines did not induce such an agent. The cells in one of the former lines collapsed in the abdominal cavity of a mouse of the 7th generation in a successive inoculation series, and the mouse yielded viscous ascites containing a biological agent designated as IA10-agent. This agent, assumed to be a mutant of 2n-agent, was activated by x-ray irradiation. Hypodermic injections of IA10-agent also produced infection in mice, but the infection was harder to maintain than that induced with 2n-agent. Compared with 2n-agent, IA10-agent was less virulent when injected i.p. Some difference in virulence was noted between IA10-agents induced by x-ray irradiation of infected tumor cells and IA10-agents that multiplied in the mouse body.

4869 PROTEIN BIOSYNTHESIS BY THE PULMONARY ALVEOLAR MACROPHAGE: CONDITIONS OF ASSAY AND THE EFFECTS OF CIGARETTE SMOKE EXTRACTS. *(E.)* Low, R. B. (Dep. Physiol. Biophysics, Univ. Vermont, Burlington). *Am Rev Respir Dis* 110(4):466-477, 1974.

The ability of pulmonary alveolar macrophages (from New Zealand white male rabbits) to incorporate radioactive leucine into protein in the presence and absence of aqueous smoke extracts was studied. First the quantitative and qualitative patterns of protein synthesis by the pulmonary alveolar macrophages were investigated by measuring the uptake of radioactive leucine into protein. A preliminary analysis comparing noninduced and bacille Calmette Guerin-induced cells (BCG) indicated that the two cell types have similar protein synthetic patterns, although the BCG cells were able to synthesize protein for longer time periods. Smoke extracts (prepared by the Green and Carolin method) affected the time and the extent of leucine incorporation into protein, causing an inhibition of incorporation after 15 min of incubation. This inhibitory effect was directly proportional to the amount of smoke extract and was partially reversible. Cells treated with smoke extracts released a greater percentage of the radioactive protein they had synthesized into the incubation medium than did control cells. Pretreatment or cotreatment of cells with the antioxidant amino acid, cysteine, did not prevent the inhibitory effect of the smoke extracts, although it did protect the cells' phagocytic capabilities. Dialyzed serum had a protective effect greater than that of similar concentrations of ovalbumin. The synthesis of all proteins was depressed in the presence of smoke extracts as determined by analyses of radioactive proteins using sodium dodecyl sulfate polyacrylamide gels.

4870 MALIGNANCIES POSSIBLE SECONDARY TO ANTICANCER THERAPY. *(E.)* Belpomme, D. (Paul Brousse Hosp., Villejuif, France), P. Carde, R. K. Oldham, G. Mathe, C. Jacquillat, N. Chelloul, M. Weil, G. Auclerc, C. Weisgerber, T. Tanzer and J. Bernard. *Recent Results Cancer Res* 49:115-123, 1974.

The possible role of anticancer therapy in the induction of secondary leukemia or cancer was investigated. In the first group of ten patients, four had Hodgkin's disease, three breast cancer, one carcinoma of the cervix, one Wilms tumor, and one reticulum cell sarcoma as the primary neoplasm. The second group included 18 patients with Hodgkin's disease. Primary or secondary neoplasia was diagnosed by biopsy or surgical specimens; leukemia was confirmed by standard bone marrow aspiration, and in nine cases, by bone marrow biopsy. Among 28 secondary malignancies, 13 were acute myeloid leukemia; one patient developed chronic lymphocytic leukemia. Of the remaining 13 patients, one developed breast cancer; six, adenocarcinoma; (breast, lung, thyroid, rectum and pancreas); five, epitheliomas (breast, lung, tonsil, larynx and testis), and two, Kaposi's sarcoma. The last case developed osteosarcoma. Seven of ten patients from the first group and 15 from the second group developed secondary malignancies after intensive treatment with either chemotherapy (more than two drugs, with a dose increase within more than three months), or radiotherapy (cobalt over two fields or 200 kV over three fields), or both. Except for two cases where the second malignancy occurred two months and 31 yr after the first, resp., the intervals ranged from six months to 12 yr. There was no significant difference in the mean delay of second neoplasia occurrence for either leukemia, epithelioma, or adenocarcinoma. There was however a significant difference between mean appearance times after combined intensive therapy (3.75 yr), and after only intensive radiotherapy (8.5 yr). Three of five patients who received only chemotherapy were treated with thio-tepa as the sole drug: two developed solid tumors, and one, leukemia. MOPP was the only chemotherapeutic agent administered to the other two, and both these cases developed solid tumors. Of the 18 patients treated with radio- and chemotherapy, 12 received alkylating agents (cyclophosphamide, chlorambucil, thio-tepa, or TEM); the other six were treated with a combination of drugs (MOPP, prednisone, procarbizine, and/or vinblastine). The shorter mean appearance time of the second cancer compared with previous findings seemed to be related to the combination of therapies; its occurrence seemed to depend on the intensity of treatment. Of the chemotherapeutic agents used, only thio-tepa could be suspected of a carcinogenic effect. It is concluded that even though this data suggest that anticancer therapy may lead to second cancer development, its use will continue to be necessary for treatment since the risk of carcinogenic effect seems to be much less than the therapeutic benefit.

4871 AN ELECTRON MICROSCOPE STUDY OF MITOCHONDRIAL DNA IN SPONTANEOUS HUMAN TUMOURS AND CHEMICALLY INDUCED ANIMAL TUMOURS. *(E.)* Kumar, P. M. (Christie Hosp., Holt Radium Inst., Manchester, England) and B. W. Fox. *Br J Cancer* 29(6):447-461, 1974.

The open dimer and catenated dimer contents of the mitochondrial DNA (mtDNA) of various spontaneous human solid tumors, a murine leukemia, and rat hepatomas were investigated. A phenol method was used to extract mtDNA from transplanted and primary dimethylaminoazobenzene-induced hepatomas in male Wistar rats, normal rat liver, spontaneous human tumors, (two Wilm's tumors, one neuroblastoma, and one adrenal carcinoma), butylnitrosourea-induced murine leukemias, two samples of normal human kidney, and Chinese hamster ovary fibroblasts in monolayer culture. The proportion of monomers, catenated dimers and oligomers, open dimers and small circles was determined by electron microscopy of the fractions comprising the lower and middle DNA bands in a CsCl-EthBr gradient. The tumors were compared with their normal tissue of origin where possible. Open dimers were found in the Wilm's tumors and their attached "normal-looking" kidney tissue, but not in normal, nonmalignant kidney or any other tissue studied. Malignancy was associated with little change in the relative proportions of catenated dimers and oligomers in the tissues studied, and small circles were found associated with the mtDNA from every tissue. The tumor mtDNA was not more heterogeneous in length than the monomers from the corresponding tissue, nor was the mean length of the tumor mtDNA significantly different from its corresponding normal mtDNA. The results suggest that catenated dimers may be produced by a different mechanism than open dimers.

4872 COMPARISON OF THE GENETIC ACTIVITY OF DIMETHYLNITROSAMINE, ETHYL METHANESULFONATE, 2-ACETYLAMINOFLUORENE AND ICR-170 IN *SACCHAROMYCES CEREVISIAE* STRAINS D_3, D_4, and D_5 USING *IN VITRO* ASSAYS WITH AND WITHOUT METABOLIC ACTIVATION. *(E.)* Brusick, D. (Coll. Med., Howard Univ., Washington, D.C.) and H. Andrews. *Mutat Res* 26(6):491-500, 1974.

Three strains of *Saccharomyces cerevisiae* (D_3, D_4, and D_5), routinely employed in assays to evaluate the genetic properties of chemicals, were compared for their ability to respond to four known mutagens. The comparisons were conducted using *in vitro* assays with and without the incorporation of hepatic metabolic enzyme fractions from mice. Two of the mutagens, ethyl methanesulfonate (EMS) and 2-methoxy-6-chloro-9-[3-(ethyl-2-chloroethyl)aminopropyl-amino] acridine dihydrochloride (ICR170) are directly active *in vitro*, and induced mitotic events in all three strains. At a 1.0% concentration, EMS exhibited greatest activity against strain D_3 followed by D_5 and D_4, resp. ICR-170 at 10 μg/ml demonstrated similar levels of activity in strains D_3 and D_5 with only slightly lower activity in D_4. The remaining two compounds, dimethylnitrosamine (DMNA) and 2-acetylaminofluorene (AAF), require metabolic activation to activate intermediates genetically, which necessitated the addition of an enzyme system to the assay. At 77.0 μM/ml, DMNA was most active against strain D_4 with D_3 and D_5 showing an approximately equal response. AFF (0.175-17.50 mg/ml) did not demonstrate any genetic activity in any of the strains. The overall results suggest that none of the three indicator strains is either significantly more or less sensitive than the others for all test compounds. Thus, selection of one of the strains for *in vitro* assays must be made on other criteria. If a large number of compounds are to be screened rapidly and economically, D_4 might be a suitable choice. If an evaluation of a chemical's ability to induce true mitotic events is desired, strain D_5 would be the likely choice. The broad range of other events detected by this strain is also advantageous in reducing compound-associated specificity. Whether D_3 would be suitable for alkylating agents similar to EMS remains to be determined.

4873 EFFECTS OF CHEMICAL CARCINOGENS ON NEOPLASTIC TRANSFORMATION AND MORPHOLOGY OF CELLS IN CULTURE.

(E.) Sanford, K. K. (Natl. Cancer Inst., Bethesda, Md.), S. L. Handleman, C. H. Fox, J. F. Burris, M. L. Hursey, J. T. Mitchell, J. L. Jackson and R. Parshad. *J Natl Cancer Inst* 53(6):1647-1659, 1974.

The mechanism by which chemical carcinogens induce neoplastic transformation *in vitro* was investigated. Recently explanted cells and long-term tissue culture cell lines derived from fetal mouse, rat, and Syrian hamster and adult Chinese hamster tissues were subjected to short-term (1-2.5 hr) exposure to 4-nitroquinoline-1-oxide (NQO, 1 μM) or repeated short-term exposure to NQO or N-methyl-N-nitrosourea. The cultures were assayed for neoplastic transformation by implantation into syngeneic and/or X-irradiated hosts. Although "spontaneous" neoplastic transformation occurred in the mouse and Chinese hamster cells, the carcinogens neither induced such transformation nor enhanced the spontaneous change. Secondary and tertiary cultures of Syrian hamster embryo cells were treated several times for 48-72 hr with either 1 μM NQO or 1 μg 3-methylcholanthrene/ml. Both carcinogens appeared to promote the establishment of continuous cell lines and to induce neoplastic transformation. Immediately after carcinogen treatment, some cultures contained fusiform cells growing in random crisscross pattern; this is a morphological marker of carcinogen-induced transformation. These cultures did not form tumors in untreated hosts, whereas most of the carcinogen-treated cell lines that later grew as sarcomas showed neither fusiform shape nor a crisscross growth pattern. Although no single morphologic event could be definitely associated with neoplastic transformation, combinations of morphologic features showed a high correlation with tumor production *in vivo*.

4874 THE ULTRASTRUCTURAL EFFECTS OF AFLATOXIN B_1 IN THE RAT PANCREAS.

(E.) Rao, M. S. (Univ. Kansas Med. Cent., Kansas City), D. J. Svoboda and J. K. Reddy. *Virchows Arch* [*Zellpathol*] 17(2):149-157, 1974.

The acute effects of aflatoxin B_1 (AFB$_1$) on the morphology of the acinar cells of the exocrine pancreas were studied in inbred male F-344 rats given one or two i.p. injections of 250 μg/kg AFB$_1$. By light microscopy, the changes were unremarkable except for a slight decrease in the number of zymogen granules in animals given a single dose of AFB$_1$ and a marked reduction in number in animals given two doses. By electron microscopy, the changes were: (a) a progressive decrease in the number of zymogen granules and, by 48 hr, irregularity of the limiting membrane, (b) dilation of Golgi vesicles at 24 hr, (c) dilation of endoplasmic reticulum and disaggregation of ribosomes at 24 hr, and (d) areas of focal cytoplasmic degradation at 48 and 72 hr. Marked mitochondrial changes in animals treated with two doses of AFB$_1$ resembled those seen in livers of animals treated with AFB$_1$ or carbon tetrachloride. The observed changes, though not specific, clearly suggest that AFB$_1$ is a pancreaticotoxic agent.

4875 METABOLISM OF AFLATOXIN B_1 AND ITS METABOLISM-DEPENDENT AND INDEPENDENT BINDING TO RAT HEPATIC MICROSOMES.

(E.) Gurtoo, H. L. (Roswell Park Mem. Inst., Buffalo, N.Y.) and T. C. Campbell. *Mol Pharmacol* 10(5):776-789, 1974.

The metabolism of aflatoxin B_1 by rat hepatic microsomes was studied with difference spectroscopy. Microsomal preparations were purified from normal or phenobarbital-stimulated male Sprague-Dawley rats and were incubated with aflatoxin in the presence of an NADPH-generating system. Aflatoxin metabolites were isolated by Sephadex gel filtration. A decrease in absorbance at 360 nm due to the disappearance of aflatoxin B_1 during its metabolism, was caused by the formation of a metabolite having a spectral peak at 398 nm. From the solubility, spectral and microsomal binding characteristics, this metabolite appears to be aflatoxin B_2a (aflatoxin hemiacetal). Difference spectroscopic studies on microsomes reisolated from incubation mixtures containing aflatoxin B_1 with or without NADPH showed that aflatoxin B_1 was bound to microsomes, giving a complex having a spectral peak at 360 nm; this binding did not require NADPH and the complex could be separated by gel filtration chromatography. A metabolite of aflatoxin B_1, the formation of which was NADPH-dependent, was bound to microsomes, yielding a complex having a spectral peak at 405 nm; this complex was not dissociated by gel chromatography, by treatment with trichloracetic acid, or by extraction with chloroform and acetone. SKF 525-A and L-cysteine inhibited the formation of this complex, the former by inhibiting the metabolic conversion of aflatoxin B_1 to aflatoxin B_{2a} and the latter by blocking the binding of the metabolite to microsomes. Aflatoxin B_1 and aflatoxin B_{2a} appeared to bind to different sites on the microsomes. A change in pH caused an alteration in the structure of aflatoxin B_{2a} and its extraction with chloroform. pH equilibria for this phenomenon were estimated to be 3.00 and 7.35. Based on these studies, it is proposed that aflatoxin B_1, under alkaline conditions, cleaves to yield a dialdehyde derivative(s) which binds to microsomes, forming Schiff bases with free amino groups. These studies also indicate that under certain conditions, rat hepatic microsome-mediated conversion of aflatoxin B_1 to a water-soluble metabolite, which appears to be aflatoxin B_{2a}, represents a major metabolitic pathway.

4876 BIOLOGICAL ACTIVITY AND ELECTRONIC STRUCTURE OF THE AFLATOXINS.

(E.) Heathcote, J. G. (Univ. Salford, England) and J. R. Hibbert. *Br J Cancer* 29(6):470-476, 1974.

The electronic structures of versicolorin A and aflatoxins B_1, G_1, and 4-20 dehydro B_1 were determined *via* the simple Hückel molecular orbital method using a computer to see whether there is a correlation between electronic structure and biological activity in these compounds. The molecular orbital calculations were expressed in terms of the charge density, the free valency of each atom in the molecule, and bond order of pi-electrons of the interatomic bonds. The calculations showed that the 2-3 pi-bond, which has the highest bond order of the aflatoxin molecules, should be the most susceptible to electrophilic attack and is the most probable location of the K region of the molecule. This is in agreement with the previous observation that aflatoxins B_1 and G_1 hydrate rapidly in dilute acid to the hydroxyaflatoxins B_{2a} and G_{2a} with an apparent total loss of carcinogenicity. The calculations also showed that aflatoxins B_1, G_1, and M_1 have no suitable site for an L region, which probably accounts for their highly carcinogenic nature. Versicolorin A probably has an L region in the anthraquinone portion of the molecule. These data provide the theoretical basis, in molecular orbital terms, for a correlation between electronic structure and carcinogenic activity in the aflatoxins.

877 EFFECT OF HEPATOCARCINOGENIC AZO DYES ON GLUTATHIONE AND RELATED ENZYMES IN RAT LIV-

R. *(E.)* Taniguchi, N. (Dep. Biochem., Hokkaido
niv. Sch. Med., Sapporo, Japan), Y. Tsukada, K. Mu-
uo and K. Hirai. *GANN* 65(5):381-387, 1974.

he activities of the enzymes gamma glutamyl trans-
epidase, glutathione perodixase and glutathione re-
uctase and glutathione levels in the liver were
easured at various intervals during the feeding of
onryu rats with 4-(dimethylamino)azobenzene (DAB)
s a strong carcinogen or 4'-methyl-4-(dimethylamino)
zobenzene (4'-Me-DAB) as a weaker carcinogen. The
ats were fed a semisynthetic basal diet for two
eeks, then divided into three groups based on their
iet: group one-basal diet alone; group two-basal
iet containing 0.06% DAB; group three- basal diet
ontaining 0.06% 4'-Me-DAB. The level of gamma-
lutamyl transpeptidase changed markedly by the azo
ye feeding. The activity increased in the early
tage (three days) and then decreased (42 days), and
gain increased (70 days) in the late stage. The
ctivity in the hepatoma that developed (at 140 days)
as 40 times higher than that in the normal rat liv-
. Changes in the ratio of glutathione peroxidase
ctivity to glutathione reductase activity and the
tio of oxidized glutathione level to the total glutathione level (oxidized glutathione plus reduced glutathione) were calculated throughout the process of azo dye feeding. The activity ratio increased to a value 2-3 times higher than that of the normal liver in 1-3 days of azo dye feeding, then decreased until the 70th day, followed by rise to a maximum at about the 140th day. In the induced hepatoma the ratio of the enzyme activities was close to the values of 1-1.5. This suggested the effective coupling of these enzymes in hexose monophosphate pathway in the hepatoma tissue against those of the normal rat liver. The ratio of oxidized glutathione level to the total glutathione level was very low in the hepatoma tissues compared to the normal rat liver.

4878 A KINETIC ANALYSIS OF DEATH AND SURVIVAL IN HELA CELLS FOLLOWING EXPOSURE TO METHYLAZOXYMETHANOL ACETATE.

(E.) Bedford, A. J. (Sch. Med., Univ. Leeds, England), E. H. Cooper and T. E. Kenny. *Eur J Cancer* 10(11):713-720, 1974.

Time lapse microcinematography was used to follow the fate of progeny of HeLa cells exposed to 100 μg/cm ^{3} methylazoxymethanol acetate (MAM acetate) for three hr in the G1 phase or to 20 μg/cm ^{3} in the G2 phase. At the higher dose level, there was a marginal prolongation of interphase in the first cycle, but the first mitosis was normal in duration. Extension of the second interphase was pronounced and the second mitosis was also prolonged. This alteration of kinetics was less evident in the third cycle and was not exhibited by survivors during the fourth cycle. An increase in the incidence of tripolar divisions was restricted to the second mitosis. The majority of cell deaths occurred in the second and third cycles, with cells in the second cycle but not the third exhibiting a rounding up prior to death. A similar but less extensive disturbance in kinetics occurred with the lower concentration of MAM acetate. By the third cycle, both interphase and mitotic times returned to control values. All cells survived the first cycle and completed mitosis, and survival in the second and third cycles was higher at this dose. Again a period of rounding up prior to death was seen in the second cycle but not in the third. Analysis of clonal death showed that at the higher level, all first generation cells had received injury sufficient to affect one or more of the progeny. At the lower level, 20% of the originally treated cells sustained no lethalities in any of their progeny. Chromosome analysis, performed at time of mitosis of cells treated with 100 μg/cm ^{3} MAM acetate, showed a peek incidence (50%) of chromosomal aberrations at 80-90 hr. The aberrations were either localized to single chromosomes or were seen in several or all chromosomes as variable patterns of gaps, breaks, and chromatid exhanges. These chromosomal aberrations were associated with the formation of anaphase bridges and deletions, due to the failure of acentric fragments to migrate to the poles of the mitotic spindle. It is concluded that cell death in the second cycle is associated with an arrest in mitosis and that a proportion of cell loss in the third cycle is the consequence of genetic deletions and the associated loss of viral information.

4879 DEMONSTRATION OF GLUCOSE 6-PHOSPHATASE ACTIVITY IN THE OVAL CELLS OF RAT LIVER AND THE SIGNIFICANCE OF THE OVAL CELLS IN AZO DYE CARCINOGENESIS.

(E.) Ogawa, K. (Sapporo Med. Coll., Japan), T. Minase and T. Onoe. *Cancer Res* 34(12): 3379-3386, 1974.

The fate of oval cells proliferated during azo dye hepatocarcinogenesis was investigated by an electron microscopic histochemical method for examining glucose-6-phosphatase activity, as well as by light microscopy. Wistar rats were fed a synthetic diet containing 0.06% of the azo dye 3'-methyl-4-dimethylaminoazobenzene for 1-6 weeks. Controls were fed the same diet without the dye. The rats were then fasted for 12 hr and the liver fixed by perfusion of glutaraldehyde through the portal vein. Paraffin and frozen sections for light microscopy were made for hematoxylin and eosin staining, and for glucose 6-phosphatase histochemistry, resp. Electron microscopic histochemistry of glucose 6-phosphatase was studied chiefly in the livers of rats fed the carcinogen for four weeks. Light microscopy showed that proliferation of the oval cells began about one week after initiation of the azo dye feeding, appearing first in the periportal spaces and gradually appearing in clusters and rows between parenchymal cells in the midzonal and periportal areas, finally replacing most of the hepatocytes in those areas. Various intensities of glucose 6-phosphatase activity were found in some cells in the proliferating areas, but these could not be identified as oval cells. Electron microscopy showed some oval cells with little or no glucose 6-phosphatase activity and characteristics of ductular cells, including irregular nuclei and scant cytoplasm containing few, small mitochondria and poorly developed endoplasmic reticulum. Other oval cells showed intense glucose-6-phosphatase activity and had characteristics of hepatocytes, including round nuclei, numerous large mitochondria, and well-developed endoplasmic reticulum. Various transitional types between these two were observed, the intensity of the enzyme activity being proportional to the grade of resemblance to hepatocytes. It is suggested that the oval cells transform into hepatocytes.

4880 DEVELOPMENT OF A 7,12-DIMETHYLBENZ(*a*)ANTHRACENE-INDUCED, TRANSPLANTABLE, HORMONE-SENSITIVE MAMMARY TUMOR IN THE RAT.

(E.) Gala, R. R. (Wayne State Univ. Sch. Med., Detroit, Mich.) and S. L. Peck. *J Natl Cancer Inst* 53(5):1289-1293, 1974.

Hormone-sensitive and hormone-insensitive transplantable mammary tumors were developed in the rat. Tumors derived from a female Sprague-Dawley rat treated with 7,12-dimethylbenz(*a*)anthracene (DMBA) were transplanted s.c. over three generations into mature female Sprague-Dawley hosts. The tumors were of two histological types: sarcoma and adenoma. The percentage of tumor "takes" increased with each generation of transplantation. The sarcoma transplants grew much faster than the adenoma transplants and were not influenced by ovariectomy, estrogen administration, or anterior pituitary (AP) kidney capsule grafts. The growth of the adenoma, on the other hand, was retarded by ovariectomy and stimulated by estradiol administration and AP grafts. Serum prolactin levels were higher in the hormone-treated rats. No estrogen receptors were found in the sarcoma, but the adenoma had high concentrations of such receptors. The number of receptors in the latter was increased by ovariectomy and decreased by estradiol administration and AP grafts. The development of hormone sensitive and insensitive transplantable mammary tumors will permit evaluation of the effect of various drugs and hormones on tumor growth in the same animal. This approach should introduce a more uniform animal model to study the mechanisms which regulate the growth of mammary tumors.

4881 GLYOXALASE SYSTEM ENYZME ACTIVITY IN THE LIVER OF RATS FED DIMETHYLAMINOAZOBENZENE.

(E.) Jerzykowski, T. (Silesian Med. Acad., Katowice, Poland), W. Matuszewski and R. Winter. *Neoplasma* 21(6):679-683, 1974.

Glyoxalase I and glyoxalase II activities were determined at intervals in the livers of male Sprague-Dawley rats fed a standard diet containing 0.06%-*p*-dimethylaminoazobenzene for about seven months. Liver homogenates were centrifuged and supernatant enzyme activity was determined by spectrophotometric and manometric methods. The activity of both glyoxalase I and glyoxalase II tended to increase in the initial phase of the experiment (up to about five weeks) and then decreased progressively to about 60% of that of control liver. These findings confirm the previously reported decrease in glyoxalase system activity in hepatoma induced in rats by feeding with dimethylaminoazobenzene. The changes in enzyme activity may represent a breakdown of the cell-division regulation system in cancerous cells.

4882 NUCLEAR AND CYTOPLASMIC OESTROGEN RECEPTORS IN VAGINAL AND UTERINE TISSUE OF MICE TREATED NEONATALLY WITH STEROIDS AND PROLACTIN.

(E.) Shyamala, G. (Univ. California, Berkeley), T. Mori and H. A. Bern. *J Endocrinol* 63(2):275-284, 1974.

Nuclear and cytoplasmic estrogen receptors in vaginal and uterine tissue were studied in female BALB/cCrgl mice treated neonatally with s.c. injections of estradiol-17β (5-20 μg); testosterone (5-20 μg); unlabelled estradiol-17β (0.1 μg); [^{3}H]estradiol-17β (0.1 μg); [^{3}H]estradiol (0.1 μg); or 5 μg estradiol plus 5 μg prolactin. The degree of steroid sensitivity on target tissues was assessed by measurement of the receptor contents. Cornification and any associated physical changes did not have a significant influence on the estrogen receptors. Vaginal estrogen responsiveness (dependence) of mice treated with low and high doses of steroids was correlated with estrogen receptor content. Neonatal treatment with prolactin in combination with low doses of steroids favored development of ovary-dependent cornification and a concomitant decrease in estrogen receptors in about 50% of the mice studied.

4883 REGULATION OF THE PROLIFERATION RATE OF CULTURED, ANDROGEN-RESPONSIVE CELLS DOES NOT INVOLVE CHANGES IN CYCLIC AMP LEVELS.

(E.) Robinson, J. H. (Imp. Cancer Res. Fund, London, England), J. A. Smith and R. J. B. King. *Cell* 3(4):361-365, 1974.

Cyclic AMP levels in cells cultured from the mouse mammary carcinoma Shionogi 115(S115) were studied in relation to density-dependent and steroid-dependent growth regulation. The rate of cell proliferation was higher in testosterone-treated cells than in untreated cells, and this rate decreased continuously during growth in both treated and untreated cells. The amount of cyclic AMP per mg protein remained constant during growth in treated and untreated cells, however the amount of cyclic AMP/cell decreased with increasing density. Addition of dibutyryl cyclic AMP (0.01-0.50 mM) or theophylline (0.01-1.00 mM) to the culture medium caused an inhibition of growth, even in the presence of androgen. The authors concluded that cyclic AMP was not involved in the density-dependent or in the steroid-dependent regulation of growth of the S115 cells.

884 COCARCINOGENIC VERSUS INCOMPLETE CARCINOGENIC ACTIVITY AMONG AROMATIC HYDROCARBONS: ONTRAST BETWEEN CHRYSENE AND BENZO(B)TRIPHENYLENE.

E.) Horton, A. W. (Univ. Oregon Med. Sch., Portand) and G. M. Christian. *J Natl Cancer Inst* 53(4): 017-1020, 1974.

ocarcinogenic and incomplete carcinogenic activity as studied in six polycyclic aromatic hydrocarbons: hrysene (C), fluoranthene (F), pyrene, triphenylene T), perylene (P), and benzo(b)triphenylene (BT). he hydrocarbons were applied (twice each week for 0 weeks to the interscapular area of two month old ale C3H mice) in either decahydronaphthalene (Decain), a noncocarcinogenic vehicle, or 50:50 Decalin: -dodecane, a cocarcinogenic mixture. Fifty mg (60 l)/application was applied. When applied in Decain, only BT produced malignant tumors; but when ombined with the Declain:n-dodecane, C, T, and pyene, but not BT, produced malignant tumors. C was articularly outstanding in its tumor production in onnection with dodecane. C and T were classified as ncomplete carcinogens, lacking any cocarcinogenic ctivity; and R and P were inactive under these exerimental conditions. The activity of the 5-ringed T was decreased when n-dodecane was introduced, ich was in contrast to the action of C and T. Esmates were made of the relative contribution of cocarcinogenic versus chrysene-like activity to the erall activity in carcinogenesis of each of the x aromatic hydrocarbons.

885 METABOLISM OF BENZO(A)PYRENE BY MICROSOMES FROM TISSUES OF PREGNANT AND FETAL HAMTERS.

(E.) Wang, I. Y. (Cancer Res. Inst., Univ. lifornia, San Francisco), R. E. Rasmussen and T. Crocker. *Life Sci* 15(7):1291-1300, 1974.

e metabolism of benzo(a)pyrene (BaP) was investated in *in vitro* studies using microsomal preparations from pregnant and fetal Syrian golden hamster tissues. On the 13th day of gestation, six hamsters were injected i.p. with BaP in corn oil (2 mg/100 g), and six other hamsters received corn oil only. Pretreatment of hamsters with BaP greatly increased the *in vitro* metabolism of BaP by lung microsomes and had less effect on the metabolism of BaP by liver microsomes. The production of various metabolites of BaP by lung microsomes was increased to different extents: 3-hydroxy-BaP was one of the major metabolites. The metabolic yields of 9,10-dihydrodihydroxy-BaP and 7,8-diol were increased more than that of the 4,5-diol. The presence of the three diols indicates that epoxides of BaP are very likely metabolic intermediates *in vivo*. The presence of cyclohexene oxide in the incubation mixtures decreased the production of the diols. Basal level enzyme activities in placental, fetal liver, and fetal skin microsomes in metabolizing BaP were very low. Pretreatment of pregnant hamsters with BaP induced BaP-metabolizing enzymes in fetal tissue two-three-fold. It is not clear which, if any, of the epoxides of BaP are the ultimate carcinogens, but the observed differences in the metabolic yields of the various diols produced by microsomes from different tissues may have some significance in the carcinogenicity of BaP.

4886 ARYL HYDROCARBON (BENZO[a]PYRENE) HYDROXYLASE INDUCTION IN RAT LIVER CELLS IN CULTURE.

(E.) Whitlock, J. P. (Natl. Cancer Inst., Bethesda, Md.) and H. V. Gelboin. *J Biol Chem* 249(8):2616-2623, 1974.

The aryl hydrocarbon (benzo[a]pyrene) hydroxylase enzyme system and its various properties were studied in an epithelial cell strain cloned from Buffalo rat liver cells. The hydroxylase was NADPH-dependent, carbon monoxide-sensitive, and the hydroxylase induction required both RNA and protein synthesis (these events could occur independently). Both transcription and translation were required for induction, but ribosomal RNA synthesis was not required. Induction required the synthesis of polyadenylic acid sequences and "heterogeneous RNA" fractions. The hydroxylase was induced by concentrations of polycyclic hydrocarbons as low as 4×10^{-10} and fetal calf serum contained substance which increased the hydroxylase activity. Polycyclic hydrocarbons also induced the enzyme system in the absence of serum added to the medium. This type of cell system may be useful for the study of the molecular biology of hydroxylase induction, for the bioassay of compounds for activity as hydroxylase inducers, and for the study of the role of the hydroxylase in chemical carcinogenesis.

4887 RESPIRATORY TRACT TUMORS IN HAMSTERS INDUCED BY BENZO(a)PYRENE AND ^{210}Po α-RADIATION.

(E.) Little, J. B. (Harvard Univ. Sch. Public Health, Boston, Mass.) and W. F. O'Toole. *Cancer Res* 34(1):3026-3039, 1974.

The incidence and histopathology of respiratory tract tumors induced in Syrian golden hamsters by multiple intratracheal instillations of benzo(a)pyrene (BP) or ^{210}Po α-radiation adsorbed onto hematite carrier particles was studied. The carcinogens were adsorbed to hematite carrier particles (Fe_2O_3) which were suspended in a 0.9% NaCl solution; 0.2 ml of the solution (3 mg of hematite particles) was instilled into the tracheae of the hamsters weekly for 15 weeks. The ^{210}Po group was given 0.01 μCi, 0.2 μCi^{c}, or 0.2 μCi/week; and 3 mg BP/week or 0.3 mg BP/week was given to another group. There was a high incidence of tumors in those hamsters treated with the carcinogens, and the incidence and mean induction time were related to the carcinogen dose. The tumor incidence ranged from 8% - 62% (for the low and high dose of BP) and 53%-97% (for the various ^{210}Po doses). BP most commonly induced epidermoid carcinomas of the trachea or major bronchi, while ^{210}Po-induced tumors were almost exclusively combined epidermoid and adenocarcinomas that arose peripherally (these occurred in 94% of those in the highest exposure group). These hamsters were particularly susceptible to the induction of lung cancer by α-radiation at doses that did not produce concomitant lung damage. They may provide a model for the study of interactions between radiation and chemical agents in respiratory carcinogenesis.

4888 THE MECHANISM OF MICROSOMAL HYDROXYLATION OF 7-METHYLBENZ(a)ANTHRACENE AND 7,12-DIMETHYLBENZ(a)ANTHRACENE BY OXYGEN-18 STUDIES. *(E.)*

Grandjean, C. (Eppley Inst. Res. Cancer, Univ. Nebraska, Med. Cent., Omaha) and E. Cavalieri. *Biochem Biophys Res Commun* 61(3):912-919, 1974.

The hydrocarbons 7-methylbenz[a]anthracene (MBA) and 7,12-dimethylbenz[a]anthracene (DMBA) were converted by Wistar rat liver microsomes to their metabolic products in the presence of $H_2{}^{18}O$ or $^{18}O_2$ in order to prove whether H_2O or O_2 was responsible for the metabolic hydroxylation of the methyl group. The isolation of pure metabolites depended heavily on the high-pressure liquid chromatograph. Excellent resolution was observed for the metabolites 7-hydromethylbenz[a]anthracene (7-HOCH$_2$BA) and 7-hydroxymethyl-12-methylbenz[a]anthracene (7-HOCH$_2$-12-MBA) from the unaltered sybstrates and other metabolic products. The product, 12-hydroxymethyl-7-benz[a]anthracene (12-HOHC$_2$-7-MBA), was not totally separated from other metabolites, but by delaying the collection of elutant a relatively pure product was obtained. The mass spectra of 7-HOCH$_2$BA obtained from MBA experiments in the presence of H_2O or $H_2{}^{18}O$ are identical, indicating that no oxygen-18 incorporation from $H_2{}^{18}O$ into 7-HOCH$_2$BA occurs. The same metabolite isolated from O_2 and $^{18}O_2$ contain an 88% oxygen-18 incorporation in the latter case. The metabolites 7-HOCH$_2$-12-MBA and 12-HOCH$_2$-7-MBA obtained from DMBA experiments also contained oxygen-18 when incubated with $^{18}O_2$. The precentage of isotope enrichment was 82% and 73%, respectively. The oxygen-18 studies prove that the formation of hydroxymethyl derivatives from methylbenzanthracenes is consistent with a direct insertion of the enzymically-induced active oxygen to the methyl group or to the chemically reactive carbon atom adjacent to the methyl group which, in the latter case, would yield hydroxy-methylbenzanthracene by an unknown rearrangement. The hydroxylation reaction of the methyl group of these compounds is a true oxygenase reaction.

4889 EFFECT OF OVARIECTOMY AND ANDROGEN ON THE GROWTH OF MAMMARY TUMORS INDUCED BY 7,12-DIMETHYLBENZ(α)-ANTHRACENE IN RATS. *(E.)*

Takahashi, T. (Kyoto Prefect. Univ. Med., Japan), T. Nakamura and S. Majima. *Jpn J Surg* 3(4):229-236, 1974.

The effect of hormonal manipulation on the growth and histology of 7,12-dimethylbenz(α)-anthracene (DMBA)-induced mammary tumors of Sprague-Dawley rats was investigated. Of 30 rats treated with DMBA (10 mg, p.o. by gastric intubation) at age 50 days, 23 developed 42 adenocarcinomas showing rapid or continuous growth. Twelve of these rats were subjected to ovariectomy and four were given dromostanolone propionate (DP, 2 mg three times/week, i.m.). The remaining seven rats served as controls. All tumors continued to grow in untreated controls. Ovariectomy alone resulted in regression of 83% of 24 tumors, but 19 tumors began to grow again after 3-12 weeks. After DP treatment, 4/8 tumors regressed with no signs of recurrence and four continued to grow. When DP was administered to ovariectomized rats with recurrent tumors, tumor growth was inhibited by 75% (6/8 tumors). Before ovariectomy the growing tumors had the histologic features of either a poorly differentiated or a tubulopapillary carcinoma. Atrophic cystic epithelium was observed after ovariectomy, while tumors growing following postovariectomy remission tended to show reversion to primary features. It is suggested that the regrowth of regressed tumors following ovariectomy was due not only to hormonal influence but also to the presence of a hormone-insensitive cell group within a tumor.

4890 POSSIBLE ACTIVATION OF C-TYPE PARTICLES DURING 'PROGRESSION' OF THE CHEMICALLY-INDUCED PULMONARY TUMORS IN MICE. *(E.)*

Kimura, I. (Aichi Cancer Cent., Res. Inst., Nagoya, Japan) and Y. Ito. *Bibl Haematol* (39):589-594, 1973.

3-Methylcholanthrene (3-MC, 0.1 mg)-induced pulmonary tumors in newborn A/Jax mice were transplanted s.c. into isologous mice. Five transplantable tumor lines were thereby established, all of which progressed gradually from benign to malignant over the course of successive transplantations. All five lines were converted into ascites form by i.p. injection of the tumor cells in the malignant stages. *In vitro* cultured cells derived from the ascites were examined by electron microscopy, as were preparations of normal lung, benign stages of the original pulmonary tumors, malignant tumors from the five solid transplantable lines, and five ascites tumor lines. Intracisternal A- and/or C-type particles were frequently observed in the malignant cells. Determination of the percentage of cells harboring the two types of virus particles and the number of particles/cell section showed that the number of particles associated with the cells tended to increase as the tumors progressed with successive transplantations; the number of particles also tended to increase when the tumors were converted into ascites form. There was no correlation between the number of particles and the histology of the tumors.

4891 ENHANCEMENT BY ALKYLATING AGENTS OF CHEMICAL CARCINOGEN TRANSFORMATION OF HAMSTER CELLS IN CULTURE.

(E.) DiPaolo, J. A. (Natl. Cancer Inst., Bethesda, Md.), P. J. Donovan and B. C. Castro. *Chem Biol Interact* 9(5):351-364, 1974.

The influence of methyl methanesulfonate (MMS), a relativley weak carcinogen, on the transformation of Syrian hamster cells by benzo(a)pyrene (BP) and other potent carcinogens was studied. Cells from fetal Syrian hamsters were pretreated with MMS, then incubated with BP, 3-methylcholanthrene (MCA), dimethylbenz(a)anthracene (DMBA), *N*-methyl-*N*'-nitro-*N*-nitrosoguanidine (MNNG), or *N*-acetoxy-2-acetylaminofluorene (AcAAF). Pretreatment of the cells with MMS, ethyl methanesulfonate (EMS), or X-irradiation increased by up to nine-fold the transformation frequency associated with BP, DMBA, MCA, MNNG, and AcAAF treatment. The degree of enhancement appeared to be ndependent of the dose of carcinogen, with maximum enhancement occurring about 48 hr after treatment and the lethality attributable to the pretreatment being 10-20% relative to controls. The enhancement produced by X-irradiation was slightly greater than hat obtained with MMS; the enhancement associated with the latter was not related to partial cell synhronization or disruption of the cell cycle. Furher, since the DNA damaged by pretreatment with MMS as rapidly repaired after treatment, repair of DNA amage was probably not involved in the enhancement henomenon. It is suggested that the alkylation of omething other than DNA may be responsible for the arcinogenic action of MMS, or alkylation may play o role and some entirely different reaction may be nvolved.

892 ANTIOXIDANTS AND CANCER. IV. INITIATING ACTIVITY OF MALONALDEHYDE AS A CARCINOGEN.

E.) Shamberger, R. J. (Dep. Biochem., Cleveland lin. Found., Ohio), T. L. Andreone and C. E. Wilis. *J Natl Cancer Inst* 53(6):1771-1773, 1974.

n order to determine the carcinogenic potential of alonaldehyde, it was applied (6 or 12 mg) to the haved backs of female Swiss mice. The known carinogens β-propiolactone (0.3 mg), glycidaldehyde 2.5 mg) or 7,12-dimethylbenz(a)anthracene (DMBA, .125 mg) were applied to other mice. After three eeks, the backs of the mice were treated daily, five ays/week for 30 weeks with 0.25 ml of 0.1% croton il in acetone. The first skin tumors were observed t five weeks in the DMBA-treated mice, at 11 weeks n the malonaldehyde-treated mice, and at 16 weeks n the propiolactone- and glycidaldehyde-treated mice. fter 30 weeks, skin tumors were present in 95% of he DMBA-treated animals, 52% of the malonaldehyde-treated animals, 44% of the propiolactone-treated animals, and 40% of the glycidaldehyde-treated animals. The skin tumors were identified as keratoacanthomas. In addition, four of the malonaldehyde-treated animals developed liver carcinomas, with metastases to the kidney and/or rectum. At 12 mg, malonaldehyde applied daily proved to be toxic and, in some cases, fatal. After daily treatment with 0.36 mg malonaldehyde, no animals died of carcinoma. Following application of malonaldehyde to the skin, only 1.9% of the applied compound was detectable after one hr. Malonaldehyde levels in the mouse skin were also determined after several carcinogens dissolved in acetone were applied to the skin; DMBA, benzo(a)pyrene, and 3-methylcholanthrene all caused an increase in the malonaldehyde levels within a few days. The results confirm the carcinogenic activity of malonaldehyde and, combined with other evidence, suggest that this compound may be the ultimate carcinogen.

4893 DIFFERENT ELIMINATION AND EFFECT ON MIXED FUNCTION OXIDASE OF 20-METHYLCHOLANTHRENE AFTER INTRAGASTRIC AND INTRAPERITONEAL ADMINISTRATION.

(E.) Aitio, A. (Dep. Physiol., Univ. Turku, Finland). *Res Commun Chem Pathol Pharmacol* 9(4):701-710, 1974.

Differences in the elimination and effect of 20-methylcholanthrene on microsomal mixed function oxidase was studied in various rat organs after intragastric and i.p. administration of the drug. Both intragastric and i.p. administration of 40 mg/kg 20-methylcholanthrene in corn oil to male Wistar rats caused an increase in aryl-hydrocarbon hydroxylase activity (AHH) in liver, duodenum and kidney. Response after intragastric administration was characterized by a rapid rise in activity in all tissues, with maxima at 12, 12 and 24 hr in the kidney, duodenum and liver, resp.; the fall to control levels was also rapid. After i.p. administration, the rise in activity was slower to appear in all tissues, and was still rising in the liver three days later. A prolonged effect was also found in the kidney, but here the highest activity detected was lower than that for intragastric administration. The effect of i.p. administration on duodenal mucosa was slight. Varying doses of 20-methylcholanthrene were given intragastrically to elucidate the different time courses of AHH induction in duodenum, kidney, and liver. Duodenal mucosal AHH responded even to corn oil without the carcinogen, and more with the smallest dose of the carcinogen given (64 μg/kg). Activity in the kidney began with a dose of 0.32 mg/kg, while the liver responded only to doses of 1.6 mg/kg, or higher. Examination of the different fecal excretion patterns after 20 mg/kg $[^{14}C]$20-methylcholanthrene-6 showed 80% excreted after intragastric administration in 24 hr, and only 30% in three days after i.p. administration. Intragastric administration of the drug enables rapid absorption and excretion, with a similarly fast and rapidly disappearing effect on AHH, whereas i.p. administration causes slow absorption, and a prolonged effect. It is suggested that the route of administration may be crucial in studies dealing with drug effects and toxicity, since the gastrointestinal mucosa (i.e., stomach, small intestine, and large intestine) may protect the organism against toxic compounds, if they are given in small enough doses.

4894 PROLACTIN-STIMULATING EFFECT ON ^{3}H-THYMIDINE INCORPORATION IN 3-METHYLCHOLANTHRENE-INDUCED CERVICAL CARCINOMAS IN NORMAL AND ESTROGENIZED MICE. *(E.)* Forsberg, J.-G. (Inst. Anat., Univ. Bergen, Norway), L. Stray-Breistein and E. Lingaas. *J Natl Cancer Inst* 53(5):1247-1252, 1974.

The effect of prolactin on the *in vitro* incorporation of ^{3}H-thymidine (^{3}H-TDR) by normal cervical cells and 3-methylcholanthrene-(MCA)-induced cervical carcinomas from oil and estrogen-treated mice was studied. Newborn female NMRI mice were given s.c. injections of 5 g estradiol-17 or 0.02 ml olive oil; the injections were repeated daily for five days. At 6-9 weeks of age, the mice were laparotomized and cotton thread impregnated with MCA and beeswax was inserted into the uterine cervix. When palpable cervical tumors were identified, the animals were killed and the tumors established in organ culture. The incubation medium contained five g ovine prolactin/ml or a corresponding volume of Parker 199 medium (controls). Prolactin significantly stimulated the incorporating of ^{3}H-TDR by the tumors from the oil-treated mice; there was no effect between ^{3}H-TDR incorporation and the histological type of the tumor. A similar effect was seen in the tumors from the estradiol-treated mice, but the degree of stimulation was not as great as in the tumors from the oil-treated animals. Prolactin also stimulated the incorporation of ^{3}H-TDR into monolayer cultures from normal neonatal cervical epithelium. The results indicate that cancer cells from the mouse uterine cervix respond to anterior pituitary hormone preparations with increased thymidine incorporation, and that this response is influenced by the hormonal state of the animal.

4895 METASTATIC RATE OF LIVER TUMORS INDUCED BY DIETHYLNITROSAMINE IN MICE. *(E.)* Kyriazis, A. P. (Pritzker Sch. Med., Univ. Chicago, Ill.), M. Koka and S. D. Vesselinovitch. *Cancer Res* 34(11): 2881-2886, 1974.

Liver tumors induced in 220 C57BL/6J X C3HeB/FeJ F$_1$ mice by i.p. injection of diethylnitrosamine were histologically examined for the presence of metastases. Animals received a total of 12 μg/g. The whole lungs from 102 one day old and 118 15 day old treated mice were examined histologically. The incidence of metastases of primary liver tumors was 21.6% in the one day old and 22.9% in the 15 day old group. The metastases were multifocal, often of microscopic size, with isolated foci showing a tendency to coalesce and form larger tumor masses. Areas of diffuse infiltration of the lung parenchyma were also seen. The primary liver tumors appeared as multifocal, solitary or confluent growths. They were composed of small rounded or large polygonal cells arranged occasionally in cords, but primarily in trabecular formations. Tumor masses within large and medium sized branches of the portal vessels were occasionally seen. These tumors metastasized to the lungs mainly by the hematogenous route. The metastic rate was only 4.3 and 0.0% for males and females, resp. The data demonstrate the capability of diethylnitrosamine induced mouse liver tumors to metastasize in the primary host with a relatively high incidence.

4896 *IN VITRO* NEOPLASTIC TRANSFORMATION OF EPITHELIAL CELLS OF RAT URINARY BLADDER BY NITROSAMINES. *(E.)* Hashimoto, Y. (Tokyo Biochem. Res. Inst., Japan) and H. S. Kitagawa. *Nature* 252 (5483):497-499, 1974.

The *in vitro* effect of N-butyl-N-(4-hydroxybutyl)nitrosamine (BBN) and N-butyl-N-(3-carboxypropyl)nitrosamine (BCPN) on rat bladder epithelial cells was studied. Cells were obtained by trypsinization from bladder mucosa of adult male rats of the inbred ACI/N strain, and were cultured in Eagle's minimum essential medium supplemented with 10% fetal calf serum and 60 μg kanamycin/ml. The cells were then cultured in the presence of urea or BCPN or BBN or a nitrosamine plus urea without removing these compounds from the medium until the cell strain was established. Tumorigenicity of cells was tested by injecting them s.c., i.p. or into the bladder wall of adult ACI/N male rats. All cell strains induced in medium containing both urea and a nitrosamine and one strain in medium containing urea alone gave rise to tumors, which were histologically squamous cell carcinomas. Epithelial cells of the urinary bladder of adult rats were transformed into neoplastic cells when treated with urea combined with either BCPN or BBN.

4897 STUDY ON THE CARCINOGENICITY OF LEAD ARSENATE AND SODIUM ARSENATE AND ON THE POSSIBLE SYNERGISTIC EFFECT OF DIETHYLNITROSAMINE. *(E.)* Kroes, R. (Natl. Inst. Public Health, Bilthoven, Netherlands), M. J. van Logten, J. M. Berkvens, T. de Vries and G. J. van Esch. *Food Cosmet Toxicol* 12(5/6):671-679, 1974.

The carcinogenicity of lead arsenate and sodium arsenate and possible synergistic or additive action between lead and/or arsenic and diet diethylnitrosamine were investigated in a lifetime (29 months) experiment with SPF-derived Wistar rats. Lead arsenate was fed in the diet at levels of 1850 or 463 ppm, while sodium arsenate was fed at a level of 416 ppm. Additional groups of rats were fed 463 ppm lead arsenate or 416 sodium arsenate in combination with diethylnitrosamine given in an incubated dose of 5 g/day on 5 days/week. The rats receiving these diets were weaned by mothers receiving the same diet during lactation. Food intake levels (for the first 12 weeks) and body weights were recorded, hematological studies were carried out after 12 mon , and complete gross and microscopic examinations were conducted at autopsy. At a level of 1850 ppm, lead arsenate was toxic and caused intra- and extrahepatic bile-duct lesions. Intranuclear inclusions due to the ingested lead were present in the kidneys and liver, but only for the first 12 months. Other histopathological changes, commonly found in these rats, were equally divided between the groups. No differences were apparent either in the tumor incidence of the different groups or in the times at which tumors were detected. An adenoma in the renal cortex and a bile duct carcinoma, both found in the group fed 1850 ppm lead arsenate, may have been indicative of a very weak carcinogenic action of this compound, but no definite conclusion can be drawn from these data. Sodium arsenate showed no carcinogenic action at the dose level used in this study. No additive or synergistic effect could be attributed to diethylnitrosamine, which also failed to induce tumors at the low dose level used, suggesting the possible existence of a no-effect level for this carcinogen.

4898 MUTAGENIC ACTIVATION OF DIMETHYLNITROSAMINE AND DIETHYLNITROSAMINE IN THE HOST - MEDIATED ASSAY AND THE MICROSOMAL SYSTEM. *(E.)* Malling, H. V. (Environ. Mutagenesis Branch, Natl. Inst. Environ.Health Sci., Research Triangle Park, N.C.). *Mutat Res* 26(6):465-472, 1974.

Dimethylnitrosamine (DMN) and diethylnitrosamine (DEN) were tested *in vitro* for the formation of mutagenic metabolites, using liver microsomal preparations from mice (C3H x C57BL/6 F_1) or rats (Sprague-Dawley), or *in vivo* in the host-mediated assay using mice or rats as hosts. The indicator organism for mutagenesis was strain G-46 of *Salmonella typhimurium*. Mutations were scored as histidine reversions. Under host-mediated assay conditions, induction of reversions in bacteria placed in the peritoneal cavity increased with increasing amounts of DMN up to 100 mg/kg; treatment with 200 mg/kg DMN gave a decrease in the induced reversion frequency. DMN gave approximately the same maximum reversion frequencies whether mice or rats were host. In contrast, mouse liver microsome preparations were at least ten times more active than rat liver microsome preparations. Using 180 mM DMN did not increase reversion frequency above the reversion frequency after treatment with 90 mM DMN. DEN (to 400 mg/kg) showed almost no mutagenic effect in the host-mediated assay. Its mutagenic action was clearly shown in the mouse liver microsome system, although activity was much lower than DMN in the same system. A possible explanation for the difference between the two systems is that in the host-mediated assay one liver is the unit of action and a rat liver is considerably larger than a mouse liver. Therefore, even if the rat liver contains less of the activating enzymes/g, as indicated in the microsomal system, the size of the rat liver makes up for its deficiency in enzyme content. In the initial stage of testing, both systems should be used for evaluating the safety of compounds to which the human population is exposed.

4899 MUTATION FIXATION IN MNNG-TREATED *HAEMOPHILUS INFLUENZAE* AS DETERMINED BY TRANSFORMATION. Kimball, R. F. (Biol. Div. Oak Ridge Natl. Lab., Tennessee) and J. K. Setlow. *Mutat Res* 22(1):1-14, 1974.

Mutation fixation was studied in *N*-methyl-*N'*-nitro-*N*-nitrosoguanidine (MNNG) (300 μg/ml) treated *Haemophilus influenzae* by transformation assay. Strains of *H. influenzae* used were: standard wild-type, Rd, which is sensitive to streptomycin and novobiocin; and a thymine-dependent derivative, resistant to streptomycin but sensitive to novobiocin. The time course of mutation fixation coincided well with that of semiconservative DNA synthesis, as judged by uptake studies and by isopycnic centrifugation of density-labeled cells. Incubation with bromodeoxyuridine (BrdUrd), 20 μg/ml, during the fixation period decreased the number of mutations fixed. Mutations fixed in the presence of BrdUrd were not more sensitive to 3r3-nm radiation than those fixed without it, suggesting that the residual mutations were fixed in the absence of extensive DNA replication. Mutations newly fixed without BrdUrd were much more sensitive to radiation than were the same mutations some cell generations later, which showed that the newly fixed mutations were in a state different from their final form, either because they were in regions of DNA with special configurations of the strands or because they were in a DNA region that was a hybrid between an old, alkylated strand and a new strand with some bases different from normal. The data suggested that it was unlikely that all the mutations fixed in *H. influenzae* arose by direct action of MNNG on the replication fork.

4900 A MOLECULAR ORBITAL STUDY ON THE CHEMICAL REACTIVITY AND BIOLOGICAL ACTIVITY OF N-METHYL-N'-NITRO-N-NITROSOGUANIDINE AND SOME RELATED COMPOUNDS. *(E.)* Imamura, A. (Natl. Cancer Cent. Res. Inst., Tokyo, Japan) and C. Negata. *Gann* 65(5):417-422, 1974.

The total energy of N-methyl-N'-nitro-N-nitrosoguanidine (MNNG) was calculated by means of the molecular orbital method, in which all valence electrons are taken into account. On the basis of the total energies obtained, relative stability was compared for various possible structures of MNNG. Electronic charges and bond orders were calculated for MNNG, N-methyl-N'-nitroguanidine (MNG), N-methyl-N-nitrosourea (MNU), and N-butyl-N-nitrosourea (BNU). The activity of MNNG and the inactivity of MNG toward nucleophilic groups such as amines are well explained by the difference in energy increment for the nucleophilic substitution.

4901 MULTIPLE CARCINOGENIC EFFECTS OF THE ETHYLNITROSOUREA PRECURSORS ETHYLUREA AND SODIUM NITRITE IN HAMSTERS. *(E.)* Rustia, M. (Univ. Nebraska Med. Cent., Omaha). *Cancer Res* 34(12):3232-3244, 1974.

The survival patterns of Syrian golden hamsters were investigated by subjecting them to the action of carcinogenic stimuli formed by the interaction of ethylurea and sodium nitrite. The treatment consisted of the simultaneous p.o. administration of either 100 mg ethylurea/kg and 50 mg sodium nitrite/kg, or 100 mg ethylurea/kg. The treatment continued for 40 consecutive daily intubations during the first six weeks. Eighty-five percent of the treated animals developed an average of over three tumors/tumor-bearing animal. Only 14% of the animals treated with ethylurea alone had single tumors, while 16% of the untreated controls also developed single neoplasms. The incidence of vascular tumors in the spleen and liver, papillomas of the forestomach and vagina, ovarian tumors and neurogenic tumors in the peripheral nervous system was significant. The findings demonstrate that adult hamsters develop a broader spectrum of neoplasms than do prenatally exposed animals to identical precursors. The functional and developmental state of the organ at the time of exposure to carcinogenic stimuli are considered possible determinants influencing the development of some tumors.

4902 RENAL TUMORS IN MICE: LIGHT MICROSCOPIC OBSERVATIONS OF EPITHELIAL TUMORS INDUCED BY ETHYLNITROSOUREA. *(E.)* Lombard, L. S. (Pritzker Sch. Med., Univ. Chicago, Ill.), J. M. Rice and S. D. Vesselinovitch. *J Natl Cancer Inst* 53(6):1677-1685, 1974.

A single postnatal injection of 1-ethyl-1-nitrosourea (0.5 or 1.0 μM/g) induced 197 renal epithelial tumors in 980 (C3HeB/FeJ x A/J)F_1 and (C57Bl/6J x C3HeB/FeJ)F_1 mice. The majority of these tumors appeared in mice older than 40 weeks. Most of the neoplasms were benign and resembled the corresponding human renal adenomas in morphology and biologic behavior. Three morphologic variants were distinguished by papillary cystic, platelike, or tubular patterns of growth. Most adenomas (78%) had a papillary cystadenomatous architecture and about 1/3 were bilateral. Malignancy was not evident with this type of neoplasm, though the dimensions of some papillary cystadenomas exceeded those of the normal kidney. In contrast, pulmonary metastases were observed from five platelike granular or clear-cell tumors and from three tubular tumors. These tumor types comprised 16% and 6% of the series, resp. Hyperplasia of the proximal convoluted tubular epithelium, with or without cystic dilation of the tubule and infoldings of the epithelium, was recognized as a preneoplastic lesion. Morphologic and staining characteristics of cells from early microscopic lesions indicated that both papillary cystic and solid-cell tumors origniated from proximal convoluted tubular epithelium. It is suggested that proliferation resulting in formation of a cyst lined by a single layer of neoplastic cells gave rise to the cystadenomas, and the proliferation in the form of multiple layers of tumor cells gave rise to the solid-cell tumors.

4903 ON THE THEORY OF CLONAL SELECTION IN CARCINOGENIC TRANSFORMATION. *(E.)* Naha, P. M. (Christie Hosp., Manchester, England) and M. Ashworth. *Br J Cancer* 30(5):448-458, 1974.

A temperature sensitive variant (ts13) of SV40-sensitive African green monkey kidney cells (cell line BSC-1) that showed high frequency transformation induced by 40 μg/ml of the carcinogen methylnitrosourea (MNU) at a restricted temperature (39.5 C) was described. Neither the variant nor the parental cell line showed any detectable change in cellular morphology when at a permissive temperature of 33 C. These ts13 cells carried a temperature sensitive lesion in thymidine metabolism. The toxic (lethal) effect of the carcinogen appeared at a concentration of 100 μg/ml. Transformed cells appeared in cultures of ts13, which were pre-incubated and treated with MNU at 39.5 C, between 1 and 2 weeks after treatment, and the frequency of transformation was optimal at concentrations of 60 μg/ml of MNU. Control cultures of ts13 incubated and treated at 33 C did not produce any transformed foci. In the parental cell line of BSC-1 which was independent of temperature effect within the range of 33 C - 39.5 C, there was no selective pressure on cells in culture, and both viability and mitotic index remained constant for each concentration of MNU. However with the temperature-sensitive ts13 cells, the restricted temperature (39.5 C) favored growth of cells at lower concentrations of MNU. This transformation at the restricted temperature was selective in nature, and single exposure was sufficient to cause transformation among the selected population.

4904 THE ONCOLOGICAL FEATURES OF XVII/g MICE. *(Rus.)* Gritsuite, L. A. (Sci. Res. Inst. Oncol., Vilnius, USSR). *Vopr Onkol* 20(11):76-77, 1974.

Oncogenesis is described in the inbred, low-cancer XVII/g mouse line obtained by breeding XVII siblings. Spontaneous pulmonary adenomas develop in 19.5% of mice surviving 15 months and in 50% surviving 24 months. Spontaneous leukemia or mammary tumors have not been observed. Exposure to ionizing radiation results in a high incidence of leukemia, solitary tumors of the salivary glands and seminomas. No increase in the incidence of pulmonary adenomas occurred. A large dose of urethane (20 mg or more) induced adenomas in 100% of the mice within 2-3 months. It is suggested that the XVII/g line is suitable for studies of pulmonary adenomas.

4905 CELL MUTAGENESIS STUDIES *IN VITRO* USING AUXOTROPHIC MARKERS. *(E.)* Kao, F. T. (Univ. Colorado Med. Sch., Denver). *Biochem Dis* 4(Part B):565-573, 1974.

4906 MECHANISMS INVOLVED IN EXPERIMENTAL HEMATOGENOUS METASTASIS AND THEIR RELATION TO HOST REACTIVITY. *(Ger.)* Arnold, W. (Cent. Inst. Cancer Res., Berlin-Buch, E. Germany) and A. Graffi. *Z Exp Chir* 7(4):216-227, 1974.

4907 THE EXPERIMENTAL INDUCTION OF ENDOMETRIAL CARCINOMA IN RABBITS WITH EMPHASIS ON CARCINOGENESIS. *(Jpn.)* Kawaguchi, K. (Tokyo Jikeikai Med. Univ., Tokyo, Japan). *Nippon Sanka Fujinka Gakkai Zasshi* 26(1):51-58, 1974.

4908 HISTOLOGIC RESPONSE OF MOUSE URINARY BLADDER TO 2-AAF IN A LARGE SUBACUTE EXPERIMENT. *(E.)* Jaques, W. E. (Natl. Cent. Toxicol. Res., Jefferson, Ark.) and C. H. Frith. *Toxicol Appl Pharmacol* 29(1):105, 1974.

4909 DETERMINATION OF 2-ACETYLAMINOFLUORENE (2-AAF) AND ITS METABOLITES BY LIQUID AND GAS CHROMATOGRAPHY. *(E.)* Fullerton, F. R. (Natl. Cent. Toxicol. Res., Jefferson, Ark.) and C. D. Jackson. *Toxicol Appl Pharmacol* 29(1):106-107, 1974.

4910 THE *IN VITRO* METABOLISM OF 2-ACETYLAMINOFLUORINE IN MOUSE LIVER. *(E.)* Gough, B. J. (Natl. Cent. Toxicol. Res., Jefferson, Ark.), K. P. Baetcke and T. E. Shellenberger. *Toxicol Appl Pharmacol* 29(1):107, 1974.

4911 TISSUE BINDING OF $[9\text{-}^{14}C]$ 2-ACETYLAMINOFLUORENE IN MICE DURING ORAL ADMINISTRATION. *(E.)* Jackson, C. D. (Natl. Cent. Toxicol. Res., Jefferson, Ark.), C. Weis and T. E. Shellenberger. *Toxicol Appl Pharmacol* 29(1):107, 1974.

4912 TOXICITY OF 2-ACETYLAMINOFLUORENE AND ITS METABOLITES IN LIVER SLICES. *(E.)* Jackson, C. D. (Veterans Adm. Hosp., Memphis, Tenn.) and C. C. Irving. *Toxicol Appl Pharmacol* 29(1):107-108, 1974.

4913 THE INFLUENCE OF AFLATOXIN B_1 ON NUCLEAR ENDODEOXYRIBONUCLEASES AND DNA OF PRIMARY MONKEY KIDNEY EPITHELIUM TISSUE CULTURE. *(E.)* Kempff, P. G. (Natl. Res. Inst. Nutr. Dis., Pretoria, South Africa), M. J. Pitout and J. C. Seegers. *S Afr J Sci* 70(3):87, 1974.

4914 EXPERIMENTAL STUDIES ON THE CARCINOGENIC ACTIVITY OF HIGHER ALCOHOLS USING 3-METHYL-1-BUTANOL, 1-PROPANOL AND 2-METHYL-1-PROPANOL AS EXAMPLES. *(Ger.)* Gibel, W. (Cent. Inst. Cancer Res., Berlin-Buch, East Germany), K. Lohs, G. P. Wildner and T. Schramm. *Z Exp Chir* 7(4):235-239, 1974.

4915 ISOLATION OF PLASMA MEMBRANES FROM NORMAL AND 1-β-D ARABINOFURANOSYLCYTOSINE TRANSFORMED HAMSTER EMBRYO FIBROBLASTS. *(E.)* Scott-Burden, T. (Dep. Biochem., Univ. Rhodesia, Salisbury) and C. J. Watts. *S Afr Med J* 39(1):15-19, 1974.

4916 PLEURAL MESOTHELIOMA AND ASBESTOS EXPOSURE. *(Ger.)* Sturm, W. (Cent. Inst. Occupational Med., Berlin, East Germany). *Z Erkr Atmungsorgane* 141(1):24-40, 1974.

4917 MESOTHELIOMATA IN RATS AFTER INOCULATION WITH ASBESTOS AND OTHER MATERIALS. *(E.)* Wagner, J. C. (No affiliation), G. Berry and V. Timbrell. *Food Cosmet Toxicol* 12(4):591-592, 1974.

4918 SERUM EFFECT ON THE YIELD OF CHEMICALLY INDUCED 8-AZAGUANINE-RESISTANT MUTANTS IN CHINESE HAMSTER CELL CULTURES. *(E.)* Wild, D. (Cent. Lab. Mutagenicity Testing, Freiburg/Breisgau, West Germany). *Mutat Res* 25(2):229-234, 1974.

4919 INFLUENCE OF 5-BROMODEOXYURIDINE ON THE EXPRESSION OF AVIAN GS ANTIGEN IN MAMMALIAN ROUS SARCOMA VIRUS-TRANSFORMED CELLS. *(E.)* Sovova, V. (Inst. Exp. Biol. Genet., Czechosovak Acad. Sci., Prague), H. Sainerova, M. Urbankova and I. Hlozanek. *Int J Cancer* 14(2):259-263, 1974.

4920 THE MECHANISM OF CHROMOSOME SEGMENTATION INDUCED BY BUDR (5-BROMODEOXYURIDINE). *(Fr.)* Butrillaux, B. (Inst. Progenesis, Paris, France) and A. M. Fosse. *Ann Genet (Paris)* 17(3):207-211, 1974.

4921 TESTING CELLULOSE AND CELLULOSE DERIVATIVES FOR THEIR CARCINOGENIC ACTIVITY IN RATS, MICE AND RABBITS. *(Ger.)* Teichmann, B. (Cent. Inst. Cancer Res., Berlin-Buch, East Germany). *Arch Geschwulstforsch* 44(3):222-234, 1974.

4922 STUDIES ON COPPER IN HUMAN SERUM AND ORGANS. *(Jpn.)* Arachi, H. (Nara Med. Univ., Japan), S. Tomii and T. Mega. *Nara Igaku Zasshi* 25(1/2):171-179, 1974.

4923 STUDIES ON CYCASIN CARCINOGENESIS. V. CARCINOGENIC PROPERTIES OF CYCASIN, METHYLAZOXYMETHANOL AND METHYLAZOXYMETHYLBENZOATE. *(Jpn.)* Hayashi, T. (Fac. Med., Kagoshima Univ., Japan), H. Sato and A. Kobayashi. *Acta Med (Fukuoka)* 44(2):163-171, 1974.

4924 EXPERIMENTAL INTESTINAL CARCINOGENESIS AND POLYP DEVELOPMENT IN RATS AND MICE. *(E.)* Wiebecke, B. (No affiliation). *Recent Results Cancer Res* 44:127-129, 1974.

4925 EFFECT OF ETHIDIUM BROMIDE AND FRACTIONATED X-IRRADIATION ON RAUSCHER LEUKEMIA DEVELOPMENT. *(E.)* OKunewick, J. P. (Allegheny Gen. Hosp., Pittsburgh, Pa.), B. J. Brozovich and P. M. Kuhnert. *Int J Cancer* 14(5):617-624, 1974.

4926 QUANTITATIVE HISTOCHEMICAL STUDIES ON THE EFFECT OF ETHIONINE ON HEPATOCYTES OF WHITE RATS. *(Fr.)* Dierickx, S. (Acad. Hosp., Ghent, Belgium) and H. Roels. *C R Soc Biol (Paris)* 168(2/3): 348-351, 1974.

4927 EFFECT OF FACTORS ON THE RAPID INDUCTION OF HEPATOCYTE HYPERPLASIA AND UNUSUAL BILE DUCT CELL PROLIFERATION IN ICR MICE GIVEN 2,7-FLUORENYL-*bis*-ACETAMIDE. *(Jpn.)* Nishio, O. (Nara Med. Univ., Japan). *J Nara Med Assoc* 25(4/5):355-366, 1974.

4928 EFFECTS OF THYROID HORMONE ON PARAMETERS OF CELL PROLIFERATION IN THE AMPHIBIAN LARVA. *(Fr.)* Chibon, P. (Univ. Sci. Med., Grenoble, France) and C. Dournon. *Ann Endocrinol (Paris)* 35(3): 296-297, 1974.

4929 EFFECT OF VARIOUS HORMONES ON THE GLUCOSE UPTAKE BY HUMAN BREAST CANCER TISSUE IN CULTURE. *(E.)* Mills, J. (Marie Curie Mem. Found., Oxted, England), T. K. Basu, N. P. Bishun and D. C. Williams. *Cytobios* 11(41):7-11, 1974.

4930 VAGINAL ADENOMATOSIS AND ADENOCARCINOMA IN YOUNG WOMEN AFTER TREATMENT WITH DIETHYLSTILBESTROL. *(Fr.)* Vooijs, G. (Inst. Pathol., Nijmegen, Netherlands). *Rev Med Liege* 29(22):682-687, 1974.

4931 THE EFFECT OF ESTRADIOL AND PROGESTERONE ON VARIOUS GYNECOLOGICAL TISSUES IN CULTURE. *(E.)* Mills, J. (Marie Curie Mem. Found., Oxted, England), N. Bishun, R. Raven and D. Williams. *J Surg Oncol* 6(6):471-479, 1974.

4932 UPTAKE OF PROGESTERONE-^{14}C AND ESTRADIOL-^{3}H BY ISOLATED NORMAL MAMMARY PARENCHYMAL AND CANCER CELLS OF THE RAT. *(E.)* Grubbs, C. J. (Univ. Tennessee Cent. Health Sci., Memphis) and R. C. Moon. *Eur J Cancer* 10(11):707-712, 1974.

4933 DISTRIBUTION AND METABOLISM OF OESTRADIOL-17β IN HUMAN CANCER AND NORMAL MAMMARY GLAND TISSUE. *(E.)* Murugesan, K. (All India Inst. Med. Sci., New Delhi), S. R. Srivastava, A. Sampath Kumar, M. M. Kapur and K. R. Laumas. *J Steroid Biochem* 5(4):337,1974.

4934 NEW TYPE OF CATALYZED REACTION BETWEEN POLYCYCLIC AROMATIC HYDROCARBONS AND PURINES OR PYRIMIDINES. *(E.)* Girke, W. (Inst. Org. Chem., Johann Wolfgang Goethe Univ., Frankfurt/Main, West Germany) and M. Wilk. *Biochem Dis* 4(Part A): 183-196, 1974.

4935 ONE-ELECTRON OXIDATION OF POLYCYCLIC AROMATICS AS A MODEL FOR THE METABOLIC ACTIVATION OF CARCINOGENIC HYDROCARBONS. *(E.)* Fried, J. (Ben May Lab. Cancer Res., Univ. Chicago, Ill.). *Biochem Dis* 4(Part A):197-216, 1974.

4936 METABOLIC ACTIVATION OF BENZO(a)PYRENE: SIGNIFICANCE OF THE FREE RADICAL. *(E.)* Nagata, C. (Natl. Cancer Cent. Res. Inst., Tokyo, Japan), Y. Tagashira and M. Kodama. *Biochem Dis* 4(Part A):87-112, 1974.

4937 TEMPERAMENT AND TUMOUR: A NOTE ON A GROWTH INDEX IN TWO STRAINS OF RATS FOLLOWING THE IMPLANTATION OF A CARCINOGENIC AGENT. *(E.)* Holland, H. C. (Bethlem R. Hosp., Beckenham, England). *Act Nerv Super* 16(1):17-19, 1974.

4938 COMPARATIVE STUDIES ON THE METABOLISM OF BENZO(A)PYRENE (BP) AND PHENACETIN (P) BY VARIOUS MOUSE STRAINS. *(E.)* Poppers, P. J. (Hoffmann-LaRoche Inc., Nutley, N.J.), W. Levin and A. H. Conney. *Pharmacologist* 16(2):262, 1974.

4939 DETERMINATION OF 4-NITROQUINOLINE-1-OXIDE, AND ITS METABOLITES IN BIOLOGICAL MATERIALS. II. THE FLUORIMETRIC DETERMINATION OF 4-AMINOQUINOLINE. *(Jpn.)* Yamane, Y. (Fac. Pharm. Sci., Chiba Univ., Japan), K. Sakai, H. Fukino, M. Ohtawa, M. Iigo and I. Morita. *J Pharm Soc Jpn* 94(12):1603-1606, 1974.

4940 INTERACTION BETWEEN THE EPITHELIUM AND MESENCHYMA IN EMBRYONIC LUNG DURING CARCINOGENESIS. II. EFFECT OF DIETHYLNITROSAMINE. *(Sp.)* de Lustig, E. S. (Fac. Med., Univ. Buenos Aires, Argentina) and E. Bal. *Medicina (Buenos Aires)* 34(2): 101-106, 1974.

4941 CLINICOPATHOLOGICAL STUDIES ON EXPERIMENTAL DOG LIVER TUMORS AS MODEL OF HUMAN LIVER TUMORS, ESPECIALLY ON NON-EPITHELIAL TUMORS. *(Jpn.)* Matsumura, K. (Nara Med. Univ., Japan). *Nara Igaku Zasshi* 24(6):665-682, 1974.

4942 CONVERSION OF DIMETHYL- AND DIETHYLNITROSAMINE TO MUTAGENIC METABOLITES BY MICROSOME FRACTIONS FROM LIVER, LUNG AND KIDNEY TISSUES OF FOUR MOUSE STRAINS. *(E.)* Weekes, U. (Howard Univ. Coll. Med., Washington, D.C.), F. Gletten and D. Brusick. *Mutat Res* 26(5):453-454, 1974.

4943 METABOLISM OF DIMETHYLNITROSAMINE TO A MUTAGEN BY RODENT LIVER MICROSOMES. *(E.)* Frantz, C. N. (Natl. Inst. Environ. Health Sci., Research Triangle Park, N.C.) and H. V. Malling. *Mutat Res* 26(5):453, 1974.

4944 THE PRODUCTION OF INTERSTITIAL NEPHRITIS IN RATS INDUCED BY NDPS AND ITS EFFECT ON THE DEVELOPMENT OF KIDNEY TUMORS BY DIMETHYLNITROSOAMINE. *(Jpn.)* Yoshioka, Y. (Nara Med. Univ., Japan). *Nara Igaku Zasshi* 25(1/2):16-26, 1974.

4945 *IN VITRO* IMMUNOREACTIVITY AGAINST ETHYLNITROSOUREA-INDUCED TUMOURS OF THE NERVOUS SYSTEM IN THE RAT. *(E.)* Toh, B. H. (Dep. Pathol. Immunol., Monash Univ., Melbourne, Australia) and E. P. G. Guli. *Experientia* 30(12):1472-1473, 1974.

4946 PATHOLOGICAL STUDY OF TUMORS IN WISTAR RATS INDUCED BY REPEATED LARGE ORAL DOSES OF N-ETHYL-N-NITROSOURETHANE. *(Jpn.)* Fukuyama, T. (Nara Med. Univ., Japan). *J Nara Med Assoc* 25(4/5):445-467, 1974.

4947 STUDIES ON THE MECHANISM OF HYPOPROTEINEMIA IN GASTRIC CANCER. 2. ALBUMIN LEAKAGE INTO GASTRIC JUICE IN RATS WITH N-METHYL-N'-NITRO-N-NITROSOGUANIDINE INDUCED GASTRIC CANCER. *(E.)* Yamaoka, K. (Osaka Univ. Med. Sch., Japan), S. Noguchi, H. Higashi and D. Jinnai. *Jpn J Clin Oncol* 4(2):105-114, 1974.

4948 TOXIC EFFECT OF N-METHYL-N-NITROSOUREA ON NORMAL AND TRANSFORMED CELLS. *(E.)* Wilkinson, R. (Middlesex Hosp. Med. Sch., London, England) and A. H. W. Nias. *Br J Cancer* 29(1):93-94, 1974.

4949 HISTOPATHOLOGICAL STUDIES OF NERVOUS SYSTEM TUMORS INDUCED IN RATS BY TRANSPLACENTAL ADMINISTRATION OF METHYLNITROSOUREA. *(Jpn.)* Kanda, H. (Sch. Med., Gunma Univ., Maebashi, Japan). *Kitakanto Med J* 24(2):71-89, 1974.

4950 ESTABLISHMENT OF TRANSPLANTABLE KIDNEY TUMOR (NK-7801). *(Jpn.)* Sugihara, S. (Cancer Cent. Inst., Nara Med. Univ., Japan). *Nara Igaku Zasshi* 24(6):651-663, 1974.

4951 THE CARCINOGENIC ACTION OF *N*-NITROSO COMPOUNDS. THIRD COMMUNICATION: *N*-NITROSO-TETRAHYDRO-1,3-OXAZINE. *(Ger.)* Wiessler, M. (Inst. Toxicol. Chemother., German Cancer Res. Cent., Heidelberg) and D. Schmahl. *Z Krebsforsch* 82(3):257-258, 1974.

4952 STUDIES OF THE INFLUENCE OF PROFLAVINE ON THE FEUGLEN REACTION IN LIVER CELLS OF WHITE RATS. *(Fr.)* Van Damme, D. (Acad. Hosp., Ghent, Belgium) and H. Roels. *C R Soc Biol (Paris)* 168(2/3):352-355, 1974.

4953 RIFAMPICIN IN A CARCINOGEN EXPERIMENT. *(Sp.)* Bichel, J. (Cancer Inst., Univ. Aarhus, Denmark). *Folia Clin Int (Barc)* 24(10):708-711, 1974.

4954 TERATOGENIC EFFECTS OF TRYPTOPHAN ON THE DEVELOPMENT OF CHICK EMBRYO. *(E.)* Naidu, R. C. M. (Dep. Biol., Kurnool Med. Coll., India). *Experientia* 30(12):1462-1463, 1974.

4955 EFFECT OF DI-TRYPTOPHAN ON TUMORIGENESIS IN THE URINARY BLADDER AND LIVER OF RATS TREATED WITH N-NITROSODIBUTYLAMINE. *(Jpn.)* Hiramatsu, T. (Nara Med. Univ., Japan). *Nara Igaku Zasshi* 25(1/2):101-112, 1974.

4956 EFFECT OF URETHAN ON MOUSE PULMONARY TISSUE AND MORPHOLOGICAL AND BIOLOGICAL CORRELATIONS BETWEEN THE HISTOLOGICAL TYPE OF MOUSE PULMONARY TUMOR AND THE BEHAVIOR OF CULTURED CELLS. *(Jpn.)* Miyake, T. (Nara Med. Univ., Japan). *J Nara Med Assoc* 25(3):284-299, 1974.

4957 COMPARATIVE CHEMICAL ANALYSIS OF INDIAN BIDI AND AMERICAN CIGARETTE SMOKE. *(E.)* Hoffmann, D. (Am. Health Found., New York, N.Y.), L. D. Sanghvi and E. L. Wynder. *Int J Cancer* 14(1):49-53, 1974.

See also:

* (Rev): 4801, 4802, 4803, 4804, 4805, 4806, 4807, 4809, 4827, 4828, 4829, 4830, 4831, 4832, 4833, 4334, 4835, 4858
* (Immun): 5089, 5115, 5130, 5133, 5147, 5151, 5152, 5153, 5178, 5180
* (Epid): 5292

4958 CYTOTOXICITY AND MUTAGENICITY OF IRRADIATED FOOD. *(Fr.)* Moutschen, J. (Dep. Genet., Univ. Liege, Belgium). *Food Irradiat Inf* (2):51-64, 1973.

Cytological and feeding tests on the cytotoxicity and mutagenicity of food irradiated for sterilization (fruits and fruit juices, potato, flour, milk, milk powder, meat and onions) are reviewed. While irradiation caused the formation of actually or potentially toxic substances in irradiated food in some cases, cytological tests performed on embryonic roots of barley and onion and on *Drosophila* revealed little cytotoxicity. Increased frequency of chromosomal lesions was observed in embryonic roots of barley and onion treated with citrus juice irradiated at 200 krad. Inhibition of mitosis and increased frequency of chromosomal aberrations occurred in the root meristem of broad beans *Vicia faba* exposed to an aqueous extract from irradiated leaves of the same species. Mitosis was inhibited in root meristems of barley, grown on irradiated mashed potato, and the incidence of sex-linked recessive mutants in *Drosophila* increased when irradiated potato served as a nutrient medium. Increased frequency of dominant lethal mutations were found in mice fed irradiated milk. A significant increase in chromosomal lesions during spermatogenesis occurred in mice fed irradiated wheat flour. The findings indicate that the cytotoxic and mutagenic effects of irradiated food are far less powerful than those of direct irradiation.

4959 ORIGIN, MORPHOLOGIC AND FUNCTIONAL CHARACTERISTICS OF A NEW LYMPHOID CELL TYPE IN IRRADIATED MOUSE BONE MARROW. *(E.)* Haot, J. (Lab. Anat. Pathol., Univ. Liege, France), E. H. Betz, L. J. Simar and L. Revesz. *Acta Haematol* 51(3):170-178, 1974.

The origin, morphology and function characteristics of a new lymphoid cell type, which is slightly larger and has a more basophilic cytoplasm than normal lymphocytes, were determined in irradiated mouse bone marrow. The accumulation of mononucleated cells reached a maximum 12 days after whole body irradiation of mice with sublethal doses of x-rays. The cells are found in both sexes of inbred (R3, C57Bl, CBA) as well as non-inbred (Swiss albino, NMRI) strains and also in mice maintained under germ free conditions. The extent and duration of the accumulation were independent of the exposure dose in the range 80-500 r. Ultrastructural studies of the bone marrow at the time of the maximum accumulation of the mononucleated cells revealed a cell type with a particular morphology, not detectable in the cell population of normal adult marrow. Usually, this cell type had only been detected in the embryo or newborn. Grafting normal, adult bone marrow suppressed, while thymectomy enhanced the proliferation of these cells in the irradiated organism. Immunologic and functional tests suggest that the cells have either an embryonic origin, or are derivatives of haemopoietic stem cells and function either as precursors for the immunocompetent B and T cells or in an entirely different lymphoid system. The inhibition of both the immature, lymphoid cell proliferation and the development of thymic lymphomas in irradiated mice by administration of normal bone marrow, and the enhanced accumulation of the cells in the thymus by repeated irradiations according to a regime which induced lymphomas in great frequency are suggestive that the cells represent a target for the radiation induced leukemia virus.

4960 GLUCOCORTICOID-BINDING COMPONENTS IN AN IRRADIATION-INDUCED THYMOMA OF THE C57BL/6J MOUSE. *(E.)* Leinen, J. G. (Univ. Rochester Med. Cent., N.Y.), J. L. Wittliff, J. A. Kostyu and R. C. Brown. *Cancer Res* 34(10):2779-2783, 1974.

Preliminary experiments on thymocyte suspensions derived from normal thymus and γ-irradiation-induced thymomas of the C57BL/6J mouse are described. The mice received four weekly doses of 200 rads γ-irradiation at a dose of 160 rads/min. Macromolecular species capable of binding triamcinolone acetonide-^{3}H specifically and with high affinity were present. Retention of labeled steroid by isolated tumor cells varied considerably among thymomas. Using cell-free preparations and a dextran-coated charcoal procedure, tumor cytosols bound triamcinolone acetonide-^{3}H with a dissociation constant of 3×10^{-9} M. The number of binding sites was 354 fmoles/mg cytosol protein. Cytosols contained binding components that sedimented at seven to eight S on low-salt gradients and at four to five S on gradients containing 0.4 M KCl. These cytoplasmic components principally bound hormones with glucocorticoid activity as indicated by the competition of triamcinolone acetonide-^{3}H binding in the presence of 0.00005 M cortisol, dexamethasone and cortexolone as well as by progesterone and aldosterone. Neither estradiol-17β, estriol, testosterone, nor dihydrotestosterone at 0.00005 M inhibited specific binding of triamcinolone acetonide-^{3}H. Generally, the binding properties of isolated thymocytes were similar to those determined on cell-free preparations. These results suggest that glycocorticoid-binding components are not abberrant in thymic lymphomas compared to normal thymocytes. It is probable that these binding components are involved in the prevention of thymic lymphoma development in the presence of corticosteroids.

4961 RECOVERY FROM RADIATION-CARCINOGENIC INJURY TO THE MOUSE OVARY. *(E.)* Yuhas, J. M. (Biol. Div., Oak Ridge Natl. Lab., Tenn.). *Radiat Res* 60(2):321-332, 1974.

The induction of ovarian tumors in BALB/c female mice exposed to graded doses of ^{137}Cs gamma rays (49-392 rads) at rates of 1.75, 3.5, 7, 14, 28, 56 and 112 rads/day was investigated to determine quantitative relationships between dose rate and effects. Each dose/dose rate group consisted of 200 mice, with approximately 1/4 of the group distributed among each of four replicates. The doses were chosen to give a good representation of the dose response curve, and the rates spanned estimates of expected negligible (1.75 rads/day) through maximum (112 rads/day) effects. The incidence of ovarian tumors was an increasing function of both total dose and dose rate, or stated in alternate terms, a decreasing function of exposure time. The incidence varied as the second power of the dose (2.0 ± 0.16), when exposure time was held constant, demonstrating that the dose response curve for this cancer cannot be linear. The incidence was inversely related to the 0.69 power of the exposure time, and approximately 1/3 of this exposure time factor resulted from age dependent loss of sensitivity. The remaining 2/3 of the overall exposure time factor is presently under study and is concluded to be the product of both intra- and intercellular recovery. The data verify a rigorous quantitative relationship between the total dose and exposure time, and the excess number of ovarian tumors predicted by the age adjustment method.

4962 BREAST CANCER FOLLOWING MULTIPLE CHEST FLUOROSCOPY: THE ONTARIO EXPERIENCE. *(E.)* Cook, D. C. (Sch. Hyg., Univ. Toronto, Canada), O. Dent and D. Hewitt. *Can Med Assoc J* 111(5):406-409; 412, 1974.

A retrospective cancer patient/control study using record linkage was conducted to test the hypothesis, derived from experience in Nova Scotia, that artificial pneumothorax, requiring repeated fluoroscopy of the chest, is associated with an increased risk of subsequent breast cancer. Of a total 15,687 deaths due to cancer in Ontario between 1953 and 1968, there were 117 cases of persons treated at a tuberculosis sanatorium. Case notes were available on 38 patients, and 37 of them became the study group and received a control patient match based on sex, birth, and last known sanatorium treatment. The sanatorium patients treated by artifical pneumothorax were estimated to have incurred a risk of breast cancer between two and three times as high as that of contemporary sanatorium patients treated by other means. There was a tendency for the malignant disease to develop on the side of collapse, and there was evidence of a characteristic latent interval between exposure and onset. The risk was well below the level of risk suggested by a Nova Scotia study. However, because of the difference in customary positioning of the patient, which may have entailed anything from a 2-10 fold difference in the dose absorbed by breast tissue, the results from these two provinces must be regarded as consistent with one another and with the hypothesis of a simple linear relationship between cancer risk and absorbed dose of radiation.

4963 CHRONIC RADIUM INTOXICATION: CLINICAL AND AUTOPSY FINDINGS IN LONG-TERM NEW JERSEY SURVIVORS. *(E.)* Sharpe, W. D. (Cabrini Health Care Cent., New York, N.Y.). *Environ Res* 8(3):243-383, 1974.

Detailed clinical and autopsy findings are presented from 42 people associated with the New Jersey radium industry during the second and third decades of this century and who survived their initial industrial exposure to Ra-226 and Ra-228 for 25 yr or longer. Most of the cases were in good health for their years when first contacted by the New Jersey Radium Research Project. This sample represents 4.2% of all known New Jersey radium workers who could be identified by name, and 8.5% of those known to have survived 25 yr or longer. Preterminal Ra-226 burdens are known for 31, and range from a quantity (less than or equal to 0.0042 μCi) indistinguishable from naturally occurring background levels, up to 9.1 μCi. Twenty-four of the 42 had malignant tumors or blood dyscrasias. Female, but not male, life spans were shortened and fertility was possibly reduced. Conduction, nerve, and mixed pattern deafness and histories of otitis media were increased over the expected incidence. Jaw necrosis and fractures of long bones were signs of radiation injury in those with preterminal burdens above 0.6 μCi; above burdens of 1.0 μCi, carcinoma of the paranasal sinuses behaved as a radiation-induced carcinoma with a long latent period. Erythrocyte sedimentation rates were consistently increased and serum alpha-1 globulin fractions consistently decreased among the cases. Environmental and workroom contamination by radium introduced the probability of so much additional external exposure from penetrating gamma radiation that preterminal Ra-226 body burdens and radiation-yr calculations based on them may understate the cases' total radiation experience. Consequently, dose-response patterns could not be identified and this study neither confirms nor challenges the presently accepted lifetime maximum permissible human Ra-226 content of 0.1 μCi.

4964 RADIATION DAMAGE TO DNA AND REPAIR IN MAMMALIAN CELLS. *(Jpn.)* Fujiwara, Yoshisada (Med. Sch., Kobe Univ., Japan). *Tampakushitsu Kakusan Koso* 19(8):637, 1974.

4965 CARCINOGENESIS BY IONIZING RADIATION AND ITS LESSONS FOR OTHER POLLUTANTS. *(E.)* Mole, R. H. (Med. Res. Counc., Oxfordshire, England). *Radiat Res* 59(1):73, 1974.

4966 CHRONIC MYELOID LEUKAEMIA PRECEDED BY RADIOTHERAPY FOR CARCINOMA OF THE LUNG. *(E.)* Stewart, C. A. (Repatriation Gen. Hosp., Brisbane, Australia). *Med J Aust* 2(25):905-906, 1974.

4967 RADIOBIOLOGICAL MANIPULATION OF THE PRELEUKEMIC STATE. *(E.)* Ludwig, F. C. (Coll. Med., Univ. California, Irvine), M. M. Morat and W. Shug. *Radiat Res* 59(1):20, 1974.

4968 A COMPARISON OF RAT MAMMARY CARCINOGENESIS FOLLOWING TOTAL-BODY IRRADIATION AT DIFFERENT AGES. *(E.)* Shellabarger, C. J. (Med. Dep., Brookhaven Natl. Lab., Upton, N.Y.). *Radiat Res* 59(1): 103, 1974.

4969 DIRECT EVIDENCE THAT DAMAGED DNA RESULTS IN NEOPLASTIC TRANSFORMATION -- A FISH STORY. *(E.)* Setlow, R. B. (Carcinog. Program, Oak Ridge Natl. Lab., Tenn.) and R. W. Hart. *Radiat Res* 59(1): 73-74, 1974.

4970 BONE MARROW DISEASES IN PATIENTS GIVEN THOROTRAST. *(Ger.)* van Kaick, G. (German Cancer Res. Cent., Heidelberg), D. Lorenz and I. Drings. *Verh Dtsch Ges Inn Med* 79:396-398, 1973.

4971 THE LEUKEMOGENIC ACTION OF THOROTRAST. *(Ger.)* Zach, S. (Med. Polyclin., Univ. Cologne, West Germany) and J. Zach. *Verh Dtsch Ges Inn Med* 79:399-400, 1973.

4972 HEPATIC HEMANGIOENDOTHELIOMA 30 YEARS AFTER ADMINISTRATION OF THOROTRAST. *(Ger.)* Futh, U. (Potsdam Reg. Hosp., East Germany) and H. U. Pietzke. *Fortschr Geb Roentgenstr Nuklearmed* 121(3):398-399, 1974.

4973 SALIVARY GLAND TUMORS AND ATOMIC BOMB EXPOSURE, HIROSHIMA, JAPAN. *(E.)* Takeichi, N. (Res. Inst. Nucl. Med. Biol., Hiroshima Univ., Japan), F. Hirose and H. Ezaki. *Radiat Res* 59(1):103-104, 1974.

See also:

* (Chem): 4868, 4887, 4904, 4906, 4925
* (Viral): 5056

4974 ONCODUCTION. A UNIFYING HYPOTHESIS OF VIRAL CARCINOGENESIS. *(E.)* Fischinger, P. J. (Natl. Cancer Inst., Bethesda, Md.) and D. K. Haapala. *Prog Exp Tumor Res* 19:1-22, 1974.

An oncoduction theory of viral carcinogenesis attempts to explain both cellular differentiation and viral-mediated carcinogenesis within the framework of a complex 'super-operon' model. The model assumes that numerous families of partially related DNA nucleotide sequences are concerned with control of genetic expression in eukaryotes. Because these regions serve as regulators of other widely dispersed heterogenous structural genes, chemically induced changes in these regions can result in pleiotropic changes within a cell. If the control region is at or near the site of insertion of a DNA virus or oncorna virus, subsequent imperfect release may result in the disrupted control region being incorporated into the virus genome and being transferred to other cells. The insertion of viruses, whose preferential attachment sites are at or near control DNA sites, may also lead to alteration of these sites. These events will lead to one of two extremes: either a wide range of gene activity abnormal to a given cell type or, conversely, greatly increased activity of a limited number of genes. Either extreme will result in a secondary dilution effect whereby the normal phenotypic expression of a cell is inhibited because of competition between messenger RNAs. Predictions based on the oncoduction hypothesis may involve some or all of the following: (1) Some endogenous, induced viruses need never be oncogenic in any cell system. (2) A virus not oncogenic for any species might be made to carry the oncogenic information of a known tumor virus with the expected antigenic markers appearing in the tumors. (3) In very different viruses, some homology may be present if the trigger control site of virus insertion is the same. (4) Oncoduction proposes a large number of permutations of the control site but a finite number of trigger sites, each responsible for an initial given tumor type with subsequent cell selection and surface antigen modifications contributed by coding errors or host surveillance defenses.

4975 HUMAN CANCER AND ANIMAL VIRUS ONCOLOGY. *(E.)* Spiegelman, S. (Coll. Physicians Surg., Columbia U., New York, N.Y.), R. Axel, W. Baxt, D. Kufe and J. Schlom. *Cancer* 34(4):1406-1420, 1974.

DNA-RNA hybridization was used to determine whether human neoplasias contain RNA molecules having sequence homologies to those of the RNA tumor viruses known to cause similar diseases in animals. The pattern of specific RNAs found in the human tumors showed a remarkable concordance with the predictions deducible from the animal systems. Thus human breast cancer contains RNA homologous only to that of the murine mammary tumor virus (MMTV). Human leukemias, sarcomas, and lymphomas (including Hodgkin's and Burkitt's) all contain RNA with sequence homology to the murine leukemia virus (RLV) and not to MMTV RNA. Finally, as in the case of the mouse, none of the human tumors examined contained RNA related in sequence to that of the avian myeloblastosis virus. The RNA detected in all of the human neoplasias was of high molecular weight (1 X 10^7 daltons) and encapsulated with a reverse transcriptase in particles having densities between 1.16-1.19 g/ml. Further, the RNA of these human tumor particles was related in sequence to the murine viruses that cause the corresponding neoplasias in mice. Thus, four features diagnostic for the murine oncogenic viruses are satisfied by the particles found in the human cancers. Finally, "recycling" experiments showed that the DNA from human leukemic cells and lymphomatous tissue contained particle-related sequences not detectable in normal DNA. This finding was further substantiated by studies with identical twins, in which it was shown that the leukemic twin contained particle-related sequences that could not be detected in the leukocytes of his identical healthy sibling. These findings are inconsistent with hypotheses that postulate chromosomal transmission in the germ line of complete copies of the information required to produce malignancy and the associated virus particles.

4976 VIRAL ETIOLOGY OF LEUKEMIAS. ELECTRON-MICROSCOPE OBSERVATION OF VIRUS-LIKE PARTICLES. *(E.)* Torrioli, M. (Gregor Mendel Inst. Med. Genetics, Twin Studies, Rome, Italy), G. Torrioli-Riggio, L. Braconi-Romei, E. Torrioli, D. Merlini, M. Russo and A. Conforti. *Acta Genet Med Gemellol (Roma)* 22:99-107, 1973.

Citrated blood from untreated leukemic patients in remission or normal subjects was injected into virus- and mycoplasma-free fertile Halifax and Cuxhaven chicken eggs prior to incubation. Electron microscopic examination revealed striking changes in the egg membranes of the infected embryos. The perivascular cells showed irregular clumping of the nuclear chromatin, irregular cell sap density, swelling, fragmentation and degradation of the rough endoplasmic reticulum (RER), breaking off of the polysomes, and "intermediate" conformation of the mitochondria. Occasionally, virus-like particles (VLPs) were noted; they were round, with an average diameter of 800-900 Å and a dense core structure surrounded by a lighter zone delineated by a double membrane. They were most often found in the RER cisternae. Egg-to-egg transmission of these VLPs was successfully performed.

4977 MECHANISM OF ACTION OF RIBONUCLEIC ACID-DIRECTED DEOXYRIBONUCLEIC ACID POLYMERASE. I. TRANSCRIPTION OF GLOBIN MESSENGER RIBONUCLEIC ACID. *(E.)* Falvey, A. K. (Natl. Heart Lung Inst., Bethesda, Md.), J. A. Kantor, M. G. Robert-Guroff, D. J. Picciano, G. B. Weiss, J. M. Vavich and W. F. Anderson. *J Biol Chem* 249(22):7049-7056, 1974.

The synthesis of DNA complementary to rabbit globin mRNA by avian myeloblastosis virus RNA-directed DNA polymerase was studied. The reaction is dependent on mRNA as template, oligo(dT) as primer, and the four deoxynucleoside triphosphates as substrates. The 28S, 18S, and 4S RNAs are not effective as templates and oligo(dG), oligo(dC), and oligo(dA) are not effective primers. The product of the reaction is a DNA-RNA hybrid, the DNA of which has an electrophoretic mobility of 7-10S. The DNA hybridizes with globin 10S mRNA but not with 28S, 18S, or 4S RNA, nor does it hybridize with an 8-12S RNA fraction isolated from rabbit liver polysomes. Thus, the RNA-directed DNA polymerase is capable of synthesizing a DNA molecule complementary to globin mRNA; however, based on its size, the product does not appear to be a complete copy of the RNA template. Using rabbit reticulocyte 10S globin mRNA or rabbit liver mRNA as template, the RNA-directed DNA polymerase can synthesize poly(dT) when dTTP is the only substrate present; no reaction occurs in the presence of any other single deoxynucleoside triphosphate. A high molecular weight poly(dT) polymer is formed, presumably transcribed from the poly(A) region of the mRNA. Thus, under some conditions, the enzyme may "slip" during transcription so that parts of the RNA are transcribed more than once in the synthesis of a single DNA molecule.

4978 CATION PREFERENCES FOR POLY(rC)·OLIGO(dG)-DIRECTED DNA SYNTHESIS BY RNA TUMOR VIRUSES AND HUMAN MILK PARTICULATES.

(E.) Dion, A. S. (Inst. Med. Res., Camden, N.J.), A. B. Vaidya and G. S. Fout. *Cancer Res* 34(12):3509-3515, 1974.

Assay of cation preferences of RNA tumor viruses for poly(rC)·oligo(dG)-directed DNA synthesis showed that B-type murine mammary tumor virus and Mason-Pfizer monkey virus preferred magnesium. All mammalian C-type viruses preferred manganese. Ten of 25 (40%) human milk samples assayed contained DNA polymerase activity related to known mammary tumor-associated viruses, murine mammary tumor virus and Mason-Pfizer monkey virus, on the basis of (a) utilization of poly(rC)·oligo(dG) as template primer for DNA synthesis, (b) buoyant density of particle-bound DNA polymerase activity in CsCl gradients, and (c) maximal poly(rC·oligo(dG)-directed DNA synthesis in the presence of Mg^{++}, and lower activity in the presence of Mn^{++}. Electron microscopy of phospholipase C-ether-treated particulate human milk fractions, possessing poly(rC)·oligo(dG)-templated DNA synthetic activity, revealed the presence of numerous viral core-like structures. The latter also possessed relatively high levels of endogenous DNA polymerase activity by the simultaneous detection technique.

4979 STUDIES ON THE ACTIVITY OF THE A PARTICLE-ASSOCIATED DNA POLYMERASE.

(E.) Bohn, E. W. (Natl. Cancer Inst., Bethesda, Md.) and S. H. Wilson. *Cancer Res* 34(8):1977-1981, 1974.

The DNA polymerase activity in preparations of A particles from mouse myeloma was characterized. Most of the radioactive product from reactions containing polyriboadenylate [poly(rA)]·$(dT)_{12-18}$ and ^3H-deoxythymidine triphosphate (^3H-dTTP) was composed of ^3H-deoxythymidine monophosphate (^3H-dTMP) in the form of nuclease-sensitive macromolecules with an average density of 1.428 g/ml, determined in cesium sulfate gradients at neutral pH. The product therefore possessed characteristics of poly(dT). Approximately 50% of this product was similar in size to the template, poly(rA), while the remainder was of lower molecular weight. Studies on the specificity of an enzymatic assay for A particle DNA polymerase revealed that a crude homogenate from myeloma exhibited activity, and mixing of this homogenate with A particles resulted in no change in the activity of the A particle preparation. In contrast, a crude homogenate from A particle-devoid mouse liver possessed no activity, and this homogenate also did not alter the activity of A particles when the two extracts were mixed.

4980 SEPARATION OF B AND C TYPE VIRIONS BY CENTRIFUGATION IN GENTLE DENSITY GRADIENTS.

(E.) Sarkar, N. H. (Inst. Med. Res., Camden, N.J.) and D. H. Moore. *J Virol* 13(5):1143-1147, 1974.

An artificial mixture of murine type B particles (obtained from the milk of RIII mice) and type C particles (Rauscher strain of murine leukemia virus) were seperated by means of gentle (low-increment) density gradients. The best separation was obtained when the density ranged from 1.13 to 1.20 g/cm^3 in the case of sucrose and from 1.12 to 1.285 g/cm^3 when CsCl was used. In sucrose gradient, the C particles banded at 1.155 g/cm^3 and were 93% free of B particles, but the B particle band (1.173 g/cm^3) contained about 25% of the C particles. Thus, the C particles were more highly dispersed than the B particles, although the two types have fairly distinct sedimentation rates and densities. An excellent separation of the particles was obtained in CsCl, the C particles banding at 1.165 g/cm^3 and the B particles banding at 1.205 g/cm^3. The C particle band contained about 5% B particles, while the B particle band had 8% C particles. Attempts were also made to separate B and C particles from a crude mixture of the two in the presence of cell debris. Separation was much better in the CsCl gradient than in sucrose; in the former, two distinguishable, although slightly diffuse, bands were obtained. Thus, for the purification of either B or C particles, CsCl gradients are better than sucrose gradients.

4981 HIGH-MOLECULAR-WEIGHT DNA ASSOCIATED WITH INTRACYTOPLASMIC A-PARTICLE INCLUSIONS.

(E.) Smith, G. H. (Natl. Cancer Inst., Bethesda, Md.), M. Litwack and D. G. Longfellow. *Cancer Res* 34(10):2654-2662, 1974.

Total nucleic acids were isolated from purified intracytoplasmic A particles (purified from transplantable Leydig cell tumors) and analyzed by agarose: acrylamide gel electrophoresis. A major band was observed and found to be DNase sensitive; a minor band migrating in the 4-7S region of the gel was RNase sensitive. Evidence indicated that the DNA was not of cellular origin and not a simple contaminant. Extensive purification of the A particles failed to effect the removal of DNA as a major nucleic acid component and coisolation studies with ^3H-thymidine-labeled mouse embryo cells showed that cellular DNA contamination of highly purified A particles was minimal. Analytical equilibrium sedimentation analysis of A-particle-associated DNA and comparison with the buoyant density of tumor cell nuclear DNA isolated from the same tumor pool demonstrated a significantly greater density for A particle DNA. Autoradiographic grain counts obtained from electron micrographs of labeled Leydig cell tumors showed incorporation of ^{3}H-thymidine into A-particle inclusions *in situ*. These results correlated well with the specific activity of A-particle DNA isolated from these same tumors. The appearance of DNA in close association with putative nucleoprotein cores of mouse mammary tumor virus raises the possibility that this DNA represents the product of the viral reverse transcriptase or, conversely, that A particles are separate entities which share a time and space relationship with mouse mammary tumor virus. These questions must be resolved by molecular hybridization experiments between A-particle DNA and mouse mammary tumor virus 70S RNA.

4982 SYNTHESIS OF SURFACE GLYCOPROTEINS AND GLYCOSPHINGOLIPIDS IN DB-CAMP-TREATED NORMAL AND VIRUS-TRANSFORMED 3T3 CELLS. *(E.)* Sheinin, R. (Dep. Med. Biophys., Univ. Toronto, Canada), G. Yogeeswaran and R. K. Murray. *Exp Cell Res* 89(1): 95-104, 1974.

The effect of dibutyryl cyclic AMP on the synthesis of two classes of carbohydrate-containing macromolecules which form a part of the external surface of mammalian cells (glycoprotein at the periphery of the cells and the glycosphingolipids associated with the plasma membrane) was tested. Dibutyryl cyclic AMP and theophylline were added to 3T3 mouse fibroblasts, polyoma-transformed 3T3 cells, and simian virus 40-transformed 3T3 cells to give a final concentration of 0.1 and 1 mM, resp. There was a 5-fold depression in the apparent saturation density achieved by the simian virus 40-transformed cells in the presence of the drugs. Results qualitatively similar were obtained with the polyoma-transformed cells but they differed quantitatively in that these cells grew to only 1.6 times the saturation density of control 3T3 cells. Concentrations of dibutyryl cyclic AMP of 0.01 and 0.001 mM were without detectable effect on either the growth or morphology of the cells. Addition of dibutyryl cyclic AMP plus theophylline to normal or virus-transformed 3T3 cells in concentrations sufficient to alter the growth characteristics, produced no qualitative changes in the pattern of incorporation of glucosamine into glycoproteins at their extreme periphery nor of 1-^{14}C-galactose into the principal glycosphingolipids of these cells. Drug treatment did result in increased incorporation of precursor galactose into complex heteroglycans of both normal and virus-transformed cells. The results indicate that these drugs do not change the pattern of glycolipid synthesis of virus-transformed cells to that characteristic of the normal, parental cell type, even though dibutyryl cyclic AMP plus theophylline does reduce overgrowth of these cells.

4983 TWO CLASSES OF CYTOPLASMIC VIRAL RNA SYNTHESIZED EARLY IN PRODUCTIVE INFECTION WITH ADENOVIRUS 2. *(E.)* Craig, E. A. (Washington Univ. Sch. Med., St. Louis, Mo.) and H. J. Raskas. *J Virol* 14(4):751-757, 1974.

Liquid and membrane hybridization experiments demonstrated that viral RNA sequences transcribed early in adenovirus 2 infection consist of two classes. Class I sequences represent cytoplasmic RNAs that are transcribed prior to the onset of DNA synthesis, but are absent or greatly reduced in cultures harvested late in infection (18 hr). Early class II RNA, which appears to correspond to approximately 50% of the early cytoplasmic RNA sequences, is present in high concentrations in both early and late infection. Experiments were performed to correlate class I and class II early RNA with size-fractionated cytoplasmic RNA synthesized early in infection. Fractionation of RNA by gel electrophoresis or sucrose gradient centrifugation confirmed three major class sizes: 12-15*S*, 19-20*S*, and 26*S*. Total cytoplasmic RNA and RNA selected on the basis of poly(A) content contained the same size classes of viral RNA. Under standard electrophoretic conditions, the 19-20*S* and the 12-15*S* size classes appeared to contain at least two components. Hybridization-inhibition experiments were performed under nonsaturating conditions on each size class obtained by gel electrophoresis: late RNA inhibited the hybridization of 26*S* RNA by 20%, of 19-20*S* RNA by 45%, and of 12-15*S* RNA by 55%. When 18-19*S* and 12-15*S* viral RNAs purified by sucrose gradient centrifugation were similarly analyzed, late RNA inhibited hybridization of 18-19*S* RNA by 50% and that of 12-15*S* by 70%.

4984 A STUDY OF VARIOUS CHANGES IN TRANSFER RIBONUCLEIC ACID METHYLASE ACTIVITY DURING ADENOVIRUS-12 TRANSFORMATION *IN VITRO*. *(E.)* McFarlane, E. S. (Dep. Microbiol., Dalhousie Univ., Halifax, Canada). *Biochem J* 144(2):277-280, 1974.

The expression of transfer RNA methylase in normal gerbil lung cells and normal hamster kidney cells was compared with its expression in the respective cell types after transformation *in vitro* by adenovirus-12. For 21 days after exposure of either hamster or gerbil cells to adenovirus-12 the cells were not treated with trypsin. After this they were treated with trypsin as a routine at eight-day intervals. After trypsin treatment the virus-exposed cells grew very slowly at first, but by the fourth trypsin treatment they were growing faster than the control cells. There was limited change in the production of tumor-specific transplantation antigen and in the transfer RNA methylase activity after five passages after isolation of transformed cells. Even at this time, however, the activity of transfer RNA methylase inhibitor present in the normal cells was decreased in the transformed cells. When the normal-cell inhibitor was added to normal-cell transfer RNA methylase extract a decrease in transfer RNA methylase activity was seen. This decrease in activity was not observed with transformed-cell inhibitor. If normal-cell inhibitor was added to transformed-cell transfer RNA methylase, the transformed-cell transfer RNA methylase was inhibited. The presence of tumor-specific transplantation antigen and increased transfer RNA methylase activity were observed at later passages. After injection of 10^5 transformed cells at passage five into 30 newborn hamsters or 30 newborn gerbils, tumor production was seen between six and seven weeks. If transformed cells from passage ten or more were used tumors developed within 4-5 weeks. Although several new transfer RNA methylase bases were found in the transformed cell, their appearance was not detected until passage ten or later. This might mean that the change induced by the presence of virus genetic material is in the inhibitors, which in turn results in change of transfer RNA methylase expression. It is suggested that the new transfer RNA methylases may result from derepression of normal cellular transfer RNA methylases. It is concluded that the first detectable biochemical change corresponding to visible morphological changes *in vitro* is a decrease in the transfer RNA methylase inhibitor.

4985 INTERACTIONS OF ADENOVIRUS TYPE 2 WITH RAT EMBRYO CELLS. PERMISSIVENESS, TRANSFORMATION AND *IN VITRO* CHARACTERISTICS OF ADENOVIRUS-TRANSFORMED RAT EMBRYO CELLS. *(E.)* Gallimore, P. H. (Med. Sch., Birmingham, England). *J Gen Virol* 25(2): 263-273, 1974.

Indirect immunofluorescence and *in situ* hybridization techniques were used to study the synthesis of structural proteins (hexon and fiber), T-antigen, and virus DNA in rat embryo cells early after infection by adenovirus type 2 (Ad-2). In this period, Ad-2 T-antigen was located in the nuclei or cytoplasm of all rat embryo cells studied. The initial infection appeared to be slower in lung cells than in brain cells. Both these cell types showed a high level of synthesis of Ad-2 structural proteins by 72 hr post-infection. Ad-2 DNA synthesis in rat embryo fibroblasts reached a maximum level (38% of cells) at 72 hr after infection. Transformation frequency did not vary in the three rat strains studied (Wistar, AS, Hooded Lister); in all strains, transformation was most efficient in the rat embryo brain and least efficient in rat embryo muscle cells. A direct correlation between virus dose and focus formation was observed only with doses below 20 plaque-forming U/cell. Comparison of the *in vitro* characteristics of Ad-2 and Ad-12 transformed cells showed striking differences in focus morphology, T-antigen fluorescence pattern, and distribution of fluorescence. Both Ad-2 and Ad-12 foci were multilayered but the former were composed of a heterogeneous population of epithelioid cells in contrast to the homogeneous population in Ad-12 foci. Ad-12 antigen was always intranuclear and had a flecked morphology, whereas Ad-2 fluorescence was predominantly globular. The results indicate that the Ad-2/rat embryo system is a semipermissive system in which transformation occurs.

4986 AVIAN SARCOMA VIRUS TRANSFORMED HAMSTER CELLS MADE RESISTANT TO ETHIDIUM BROMIDE. *(E.)* Altaner, C. (Cancer Res. Inst., Slovak Acad. Sci., Bratislava, Czechoslovakia). *J Cell Sci* 16 (3):603-621, 1974.

Hamster cells transformed with the Schmidt-Ruppin strain of avian sarcoma virus were selected for resistance to ethidium bromide (EB). The resistant cell lines proliferated in the presence of up to 30 μg/ml EB. EB-resistant cells established from sarcoma virus-transformed cells already resistant to bromodeoxyuridine (BrdU) were able to grow in 10 μg/ml EB. These cells remain deficient in thymidine kinase activity and are suitable for selective preparation of hybrid cells. The EB resistance was genetically stable. EB-resistant cell lines and doubly resistant cells (BrdU, EB) showed no differences in mitochondrial ultrastructure compared with the original cell lines. Thymidine incorporation into mitochondrial DNA was not influenced by EB resistance. All resistant cell lines, including the doubly resistant line, contained the avian sarcoma virus genome. The number of cells needed for induction of tumors in chicks after fusion with permissive chick embryo cells was the same as that for the original cell lines. The single EB-resistant cell lines contained R-type virus particles; these particles were absent in BrdU-resistant and doubly resistant cells. The results suggest that the EB resistance is not due to a cell permeability barrier. It might be caused by mutation-induced membrane changes in some cell organelles or by mutation in the lipoprotein components of the mitochondrial membrane.

4987 PRESENCE OF AVIAN LEUKOSIS VIRUS GENES, IN DNA FORM, IN NORMAL CHICKENS. *(E.)* Baluda, M. A. (Univ. California Sch. Med., Los Angeles). *Bibl Haematol* (39):488-505, 1973.

DNA-RNA hybridization experiments using 71S RNA from avian myeloblastosis virus (AMV) as a probe for homologous DNA demonstrated the widespread presence of avian leukosis virus DNA in normal chickens. Every one of 50 apparently normal chick embryos tested contained viral DNA in amounts ranging from 1.7-4.6 viral genome Eq/cell. By comparison, the cellular concentration of viral DNA in leukemic cells and in cells infected with AMV or Rous sarcoma virus had from 4-13 viral genome Eq/cell. Even embryos which were COFAL-negative for the avian leukosis virus group-specific antigen contained as much viral DNA as their siblings or other embryos which had COFAL titers of 1:2-1:8. Some embryos contained complete viral genomes, while others appeared to contain only partial viral genomes. Chick embryos from a selected strain of chickens which are free of contamination by avian leukosis virus groups A and B and which develop 40% fewer spontaneous leukotic tumors than chickens of the original strain contained an average of only 2.1 viral DNA Eq/cell, whereas the original strain contained 3.2 viral Eq/cell. The data provide direct biochemical evidence supporting the presence of avian leukosis genes, in the DNA form, in normal chicken cells.

4988 STRUCTURAL COMPONENTS OF AVIAN MYELOBLASTOSIS VIRUS. *(E.)* Bolognesi, D. P. (Duke U. Med. Ctr., Durham, N.C.), H. Bauer, H. Gelderblom and K. Molling. *Bibl Haematol* (39):316-330, 1973.

The localization of various antigens, enzymes, and RNAs in avian myeloblastosis virus (AMV) was determined. Treatment of AMV with NP-40 released virus glycoproteins and reverse transcriptase activity. After density gradient centrifugation, the major portion of the enzyme activity was recovered at a density of 1.15 g/cm^3 while the glycoproteins were present in the 1.20 g/cm^3 density region. Gel electrophoresis of the rosette structures in the glycoprotein component revealed two glycoproteins with molecular wt of 37,000 and 115,000. The rosettes comprised about 12 subunits, each consisting of a spike and a knob and sedimenting at about 33 s in sucrose gradients. Both glycoproteins were capable of absorbing and reacting with specific neutralizing sera in immunodiffusion. Additional antigenic determinants in these polypeptides, detected with non-neutralizing rabbit sera, were distinct from Ve antigen or the major complement-fixing antigens. Treatment of the NP-40 disrupted viruses with cold ether released virus core structures which were recovered in the 1.25-1.26 g/cm^3 density gradient region. The cores comprised more than 60% of the virus RNA, all of which was high molecular wt. Only about 20% of the virus protein was present in the core preparations, and this consisted principally of complement-fixing -4 polypeptide (28,000 daltons) and a slightly larger polypeptide (30,000 daltons). All the endogenous enzyme activity was restricted to core material, as was at least half of the exogenous activity stimulated by RNA or DNA. Following application of core preparations to chick embryo fibroblasts, elaboration of virus particles containing group-specific antigen and high-molecular wt RNA was observed.

4989 STUDIES ON THE BIOLOGICAL AND ANTIGENIC PROPERTIES OF ESP-1 TYPE C VIRUS PARTICLES.

(E.) Eckner, R. J. (Roswell Park Mem. Inst., Buffalo, N.Y.), E. S. Priori, E. A. Mirand and L. Dmochowski. *Cancer Res* 34(10):2521-2529, 1974.

ESP-1 virus provides a helper function to defective Friend spleen focus-forming virus (SFFV). This helper activity is demonstrable only in B-type mice (Fv-1^{bb}) under conditions in which the N-tropic lymphatic leukemia-inducing virus contained in the Friend virus complex is inhibited. ESP-1 virus therefore expresses a B-tropic host range *in vivo* with respect to its ability to provide a helper function to defective SFFV. Further, this helper activity is directly associated with the presence of the ESP-1 virus and *Mycoplasma*. However, *Mycoplasma* derived from the ESP-1 cell line and maintained in broth culture only enhances SFFV titer estimates and fails to provide a helper function to SFFV. ESP-1 virus helper activity is dose dependent and heat labile and is neutralized by rat antiserum directed against both whole and Tween:ether-disrupted ESP-1 virus. ESP-1 is not neutralized by type-specific murine antiserum directed against both the Rauscher virus complex and the lymphatic leukemia-inducing helper virus component of the Rauscher virus complex and Moloney leukemia virus. These findings, together with the observations that these same murine antisera neutralized human-embryo-kidney-cell-grown Rauscher leukemia virus, suggest that the type C virus designated ESP-1 has some of the biological properties of the murine leukemia viruses but does not contain type-specific envelope antigen(s) characteristic of Moloney leukemia virus, N-tropic Friend lymphatic leukemia-inducing virus, or human-embryo-kidney-cell-grown Rauscher leukemia virus.

4990 ONCOGENICITY OF AN ENDOGENOUS C-TYPE VIRUS CHEMICALLY ACTIVATED FROM MOUSE CELLS IN CULTURE.

(E.) Stephenson, J. R. (Natl. Cancer Inst., Bethesda, Md.), J. S. Greenberger and S. A. Aaronson. *J Virol* 13(1):237-240, 1974.

This report demonstrates *in vivo* oncogenicity of one class of chemically induced mouse C-type virus. Of 40 newborn NIH Swiss mice inoculated with the chemically activated virus, nine developed signs of anemia and splenomegaly. Fifty untreated animals remained disease free. Gross pathological examination of the nine affected animals revealed markedly enlarged spleens, enlarged cervical, axillary, and inguinal lymph nodes; and visceral blanching consistent with anemia. Microscopic examination showed spleens massively infiltrated with mononuclear cells with loss of normal architecture. Lymph node specimens were enlarged and there was distortion of the architecture by lymphoid hyperplasia. In each case, the clinical and pathologic findings indicated a diagnosis of lymphatic leukemia. The average latent period prior to detection of leukemia was 15 months. Evidence of replicating C-type virus in inoculated animals was readily demonstrable. The chemically activated C-type virus was able to replicate in NIH Swiss mice several months prior to the presence of detectable evidence of clinical disease. No other malignancies were found in the leukemic animals. Viruses obtained from two leukemic animals were each about 2-fold more infectious than the induced virus. Viruses from the leukemic animals closely resembled the input virus in their *in vitro* biologic properties such as host range and plaque morphology. Thus this report demonstrates the oncogenic activity of one class of C-type virus that is chemically activated from virus-negative mouse cells in tissue culture. It is clear that one class of endogenous RNA virus can induce, directly or indirectly, a specific neoplasm, lymphatic leukemia *in vivo*. It is speculated that at least certain classes of naturally occurring malignancies result from the expression of individual naturally integrated and biologically distinct tumor viruses.

4991 DNA POLYMERASE IN VIRIONS OF A REPTILIAN TYPE C VIRUS.

(E.) Twardzik, D. R. (Natl. Cancer Inst., Bethesda, Md.), T. S. Papas and F. H. Portugal. *J Virol* 13(1):166-170, 1974.

The DNA polymerase of reptilian type C virus was isolated from Russell's viper spleen cells and its activity determined by measuring the conversion of ^{3}H-thymidine triphosphate into acid-insoluble material. Simultaneous detection experiments demonstrated the presence of 70S RNA and RNA-dependent DNA polymerase activity in the reptilian type C virions. The endogenous activity was dependent on the addition of all four deoxynucleotide triphosphates and showed an absolute requirement for a divalent cation. The reptilian viral DNA polymerase elutes from phosphocellulose at 0.22 M salt; in this respect, it is similar to the avian (avian myeloblastosis virus, AMV) viral enzyme but is different from the mammalian (Rauscher leukemia virus, RLV) viral enzyme which elutes at 0.4 M salt. The molecular weight of the viper DNA polymerase as estimated from glycerol gradient centrifugation is 109,000 daltons. It is a smaller enzyme than the AMV DNA polymerase (180,000 daltons) and somewhat larger than the RLV enzyme (70,000 daltons). The reptilian enzyme is stimulated by dithiothreitol as are the DNA polymerases of other type C viruses. The temperature optimum for the endogenous DNA polymerase activity in reptilian type C particles and AMV is 40-45 C; the RLV DNA polymerase has an optimum temperature of 37-40 C. Cultures of Douglas viper cells demonstrated optimal growth and produced the highest viral titers when maintained at 30 C; the cells would not grow or produce virus at 37 C.

4992 BABOON VIRUS ISOLATE M-7 WITH PROPERTIES SIMILAR TO FELINE VIRUS RD-114. *(E.)*

Hellman, A. (Natl. Cancer Inst., Bethesda, Md.), P. T. Peebles, J. E. Strickland, A. K. Fowler, S. S. Kalter, S. Oroszlan and R. V. Gilden. *J Virol* 14 (1):133-138, 1974.

A virus (M-7) isolated from baboon placental tissue shows many similarities to endogenous feline virus RD-114. Immunodiffusion analysis shows a group-specific antigen (gs-1) line of identity between M-7 and RD-114. Anti-RD-114 DNA polymerase IgG inhibits M-7 polymerase by 57% compared to 97% for RD-114. M-7 virus has helper activity as demonstrated by the rescue of murine sarcomavirus (MSV) from sarcoma-positive leukemia-negative human amnion cells. The host range of the rescued M-7 pseudotype of MSV, MSV (M-7), is similar to that of RD-114 virus. MSV (M-7) is also able to transform baboon cells and causes no detectable transformation of feline cells in the absence of helper feline leukemia virus. The interference properties of M-7 and RD-114 are identical. Virus-specific neutralizing antisera, although partially cross-reacting, can distinguish MSV (M-7) from MSV (RD-114). These data suggest type-specific differences between two viruses within the same strain.

4993 INDUCTION OF ENDOGENOUS VIRUS AND OF THYMIDINE KINASE BY BROMODEOXYURIDINE IN CELL CULTURES TRANSFORMED BY FRIEND VIRUS. *(E.)*

Ostertag, W. (Max-Planck Inst. Exp. Med., Gottingen, West Germany), G. Roesler, C. J. Krieg, J. Kind, T. Cole, T. Crozier, G. Gaedicke, G. Steinheider, N. Kluge and S. Dube. *Proc Natl Acad Sci USA* 71(12):4980-4985, 1974.

Thymidine kinase-positive (TK^+) N type cell lines transformed by spleen focus-forming virus were established by transformation with NB tropic Friend virus complex. Thymidine kinase-deficient (TK^-) cell clones were isolated. Some of these cell clones release 1000- to 100,000-fold less Friend virus complex than the TK^+ parental cell clone. Some TK^- clones exposed to bromodeoxyuridine (200 µg/ml) and then grown in medium without BUdR could be induced to release endogenous helper virus and transforming spleen focus-forming virus on rexposure to 10^{-6} BUdR. The induced Friend virus complex was N tropic. Induction of thymidine kinase activity preceded the induction of the endogenous virus spleen focus-forming virus complex, suggesting that thymidine kinase activity is a prerequisite for the activation of N tropic endogenous virus. Both thymidine kinase activity and endogenous virus release were transient in TK^- inducible cell clones. Azidothymidine did not induce endogenous virus in TK^- clones; thus, virus induction by BUdR appears to require incorporation of BUdR into cellular DNA. Inhibition of virus release in virus-positive cells may be due to a direct effect of BUdR on viral replication.

4994 STUDIES ON ERYTHROID DIFFERENTIATION OF FRIEND VIRUS-INDUCED MURINE LEUKEMIC CELLS.

(E.) Friend, C. (Mount Sinai Sch. Med., City U. New York, N.Y.), W. Scher, H. D. Preisler and J. G. Holland. *Bibl Haematol* (39):916-923, 1973.

The erythroid properties of Friend virus-induced murine leukemic cells were studied *in vitro*. The potential of the leukemic cells to differentiate is apparent in that about 1% of the cells of the mass culture stain benzidine-positive (B+), indicating synthesis of hemoglobin. In some cloned lines over 5% of the cells are B+. Cells grown in medium containing 2% dimethyl sulfoxide (DMSO) show a 24-hr lag in cell growth and a great increase in the number of B+ differentiating cells (85-90% by day 4). Results of 24 hr of continuous labeling of cells grown for one day before the addition of tritiated thymidine indicate that, whether or not DMSO was present, almost all the cells were synthesizing DNA. The initial effect of DMSO may be to increase the generation time of the leukemic cells. The maximum rates of precursor (^3H-thymidine, ^3H-uridine, or ^3H-leucine) into DNA, RNA, and protein occurred one day later in the DMSO-treated cultures than in control cultures. Lipid metabolism appears similarly decreased. Bromodeoxyuridine (BUdR, 3.0 and 1.0 µg/ml) significantly suppressed DMSO-induced hemoglobin synthesis but had no significant inhibitory effect in cultures incubated without DMSO. Cells grown in the presence of 3.0 µg/ml BUdR exhibited an early stimulation of precursor incorporation into DNA and RNA, in contrast to the delay in the peak rate of precursor incorporation in the DMSO-treated cultures. Treatment of cells with both DMSO and BUdR resulted in a further reduction in the peak rate of precursor incorporation into DNA and RNA. Compounds such as DMSO, which selectively influence the differentiation of primitive cells offer a new approach to the chemotherapy of leukemia.

4995 INTERACTION OF FRIEND LEUKEMIA VIRUS (FLV) AND SOME ARBOVIRUSES IN TISSUE CULTURE.

(E.) Pogodina, V. V. (Acad. Med. Sci., Moscow, USSR), N. B. Senyuta, Z. I. Merekalova and N. P. Mazurenko. *Neoplasma* 21(3):267-274, 1974.

Primary cultures of BALB/c mouse fibroblasts were infected with Friend leukemia virus (FLV) and 24, 48, 72, 96, 120, or 144 hr later were inoculated with one of three arboviruses (Sindbis, Getah, and attenuated clone $41/WN^+JE^+$ from the antigenic complex of Japanese encephalitis). The cells infected with FLV developed varying degrees of resistance to superinfection with Sindbis virus. Three factors affected the reproducibility of the interference phenomenon: the age of the cell monolayer; the time of superinfection; and the dose of the challenge virus. When FLV was heat inactivated, no interference was observed. The interference phenomenon was not observed between FLV and the Getah or 41/WN$^+$JE$^+$ viruses. FLV possessed marked interferon-inducing properties, the time of maximum interferon activity (48 hr postinfection) coinciding with the period of most intense interference between FLV and Sindbis virus. The varying ability of the three arboviruses to interfere with FLV was due to their different sensitivity to the action of interferon. The arboviruses had no significant influence on the reproduction of FLV in tissue culture.

4996 ENHANCEMENT OF ERYTHROCYTIC MATURATION OF FRIEND VIRUS-INDUCED LEUKEMIA CELLS *IN VITRO*. *(E.)* Sugano, H. (Cancer Inst., Tokyo, Japan), M. Furusawa, T. Kawaguchi and Y. Ikawa. *Bibl Haematol* (39):943-954, 1973.

Substances and conditions that enhance erythrocytic maturation of clonal-cultured Friend leukemia cells *in vitro* were studied extensively by staining with fluorescein-labeled antibody to normal erythrocyte membrane proteins. Dimethyl sulfoxide (DMSO), N-demethyl-rifampicin, and Bleomycin were markedly effective in enhancing erythrocyte expression; mitomycin C, cytosine arabinoside, and glycerol were moderately effective; and nitrogen mustard, vincristine sulfate, and 5-fluorouracil were slightly effective. Cells cultured at 32 C for 5-14 days in the absence of serum were also slightly stained. Cells treated with 5-bromodeoxyuridine, actinomycin D, x-ray irradiation, puromycin, cycloheximide, vitamin B_{12}, cyclic AMP, 3',5'-dibutryl cyclic AMP, Concanavalin A, or sodium lauryl sulfate were completely negative to staining, as were cells cultured in medium containing 20-40% fetal calf serum. The most frequent morphological changes induced by the effective substances were enlargement and pyknosis of the cells. Although the cytoplasm of cells treated with DMSO contained many type-C virus particles, few particles were found in the rifampicin- and Bleomycin-treated cells. Thus, there is apparently no direct relationship between the number of virus particles in the cells and the induction of erythrocyte-specific protein. It is noted that the drugs that enhanced erythrocytic maturation, including anticancer drugs, are inhibitors of DNA synthesis. Inhibitors of RNA or protein synthesis were ineffective. Synthesis of erythrocyte-specific protein occurred earlier in cells treated with anticancer drugs than in cells treated with DMSO or N-demethyl-rifampicin, indicating that the mechanism of erythrocyte maturation differs according to the substance used. The present method should be useful as a screening tool for new anticancer drugs.

4997 HERPES SIMPLEX VIRUS-INDUCED ENHANCEMENT OF MITOCHONDRIAL DNA SYNTHESIS IN THE ABSENCE OF VIRUS REPLICATION. *(E.)* Radsak, K. (Inst. Hyg., Univ. Marburg, West Germany) and M. Albring. *J Gen Virol* 25(3):457-463, 1974.

The effect of herpex simplex virus (HSV) on DNA synthesis in nuclei and mitochondria of kinase-lacking mouse cells (CI-ID) was studied. Cells were labeled with ^{14}C-thymidine (0.1 μCi/ml culture medium from 1-6 hr postinfection). Cell fractionation at 6 hr postinfection was followed by *in vitro* labeling of isolated nuclei and mitochondria with ^{3}H-thymidine triphosphate and ^{3}H-thymidine, resp., and extraction of DNA. ^{14}C-radioactivity was not detected in DNA from nuclei of mock-infected cultures but was present in infected nuclei, indicating the induction of thymidine kinase. This DNA banded exclusively in the position of virus DNA, as shown by isopynic sedimentation in CsCl-ethidium bromide. The ^{3}H-radioactivity of DNA from infected nuclei was found in the denser position of virus DNA. Thymidine uptake into mitochondrial DNA (mtDNA) was stimulated by HSV. Thymidine incorporation into mtDNA by organelles isolated at 6 hr postinfection significantly exceeded that of mock-infected controls. An identical mitochondrial reaction was observed when infected cell cultures were pretreated with cytosine arabinoside (2 μg/ml culture medium) from 1-6 hr postinfection. Administration of cycloheximide (25 μg/ml) abolished the effect of virus infection on mtDNA synthesis. These observations are discussed with respect to regulation of mtDNA synthesis in eukaryotic cells. Mitochondrial reactions in HSV-infected cells might reflect the elimination by virus-induced inhibitors of a nuclear repressor system for mtDNA replication.

4998 PERSISTENCE AND EXPRESSION OF THE HERPES SIMPLEX VIRUS TYPE 2 GENOME IN CERVICAL TUMOR CELLS. *(E.)* Aurelian, L. (Johns Hopkins U., Sch. Med., Baltimore, Md.). *Cancer Res* 34(5):1126-1135, 1974.

Findings providing information on the persistence and expression of the herpesvirus type 2 (HSV-2) genome in cervical tumor cells are presented and the results discussed in terms of the virus-host cell interaction. Exfoliated but not biopsied tumor cells from 25 of 29 patients with cervical carcinoma contain HSV-2 antigens, and HSV-2-specific surface antigens are observed in a small proportion of cells of one cervical tumor culture. A herpesvirus isolated from degenerated and nonviable cervical tumor cells grown *in vitro* is identified as a type 2, different from a standard variant, and 90% of patients with cervical carcinoma have antibody to HSV-2-induced tumor-specific antigen. Recurrent neoplastic disease in two of four patients given radiation therapy was associated with the continuous presence of antibody. The data suggest that cervical tumor cells harbor the viral genome in a partially repressed state characterized by the expression of only some viral functions. Under conditions of stress, complete expression of the viral genome may occur, resulting in the formation of viral components and/or infectious virus. Alternatively, the transcriptional program of the virus genome may vary according to the stage of the disease, or progression of the neoplastic lesion may be a function of the integration and/or transcriptional program of the persistent virus genome. It is also possible that the specific cell harboring the virus and/or the expression of those viral genes needed to transform cells may be determined by the genotype of the host.

4999 IMMUNO-SEROLOGICAL EVIDENCE FOR THE ROLE OF THE HERPESVIRUS EPSTEIN-BARR IN HUMAN TUMOURS. *(E.)* De-The, G. (Int. Agency Res. Cancer, Lyon, France). *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* p. 59-65.

A multiphase program to establish the oncogenic potential of Epstein-Barr virus (EBV) includes an investigation of the serologic response of tumor patients to the virus and a study of the sero-epidemiologic behavior of EBV in populations at different risk for EBV-associated diseases. These investigations will be followed by a prospective sero-epidemiologic study of the role of EBV in tumor development and by attempts to suppress viral infection through vaccines or by action on co-factors. The literature on the serologic association between EBV and infectious mononucleosis (IM), Burkitt's lymphoma (BL), and nasopharyngeal carcinoma (NPC), resp., is reviewed. Differences between the three diseases are noted with respect to the time of appearance and titers of various antibodies, including antiviral capsid antigen antibodies, anti-early antigen antibodies, anti-membrane antigen antibodies, and complement-fixing antibodies. Anti-early antigen antibodies in IM patients appear to be related to the acuteness of the illness. In both IM and NPC patients, these antibodies are of the anti-R (Diffuse) type; in BL patients they are of the anti R (Restricted) type. Complement-fixing antibody titers vary according to the clinical evolution by BL but remain remarkably stable in NPC patients, regardless of the state of the disease. Despite such differences, the serologic association between EBV and both BL and NPC is very similar. Since EBV is a lymphotropic virus, it is more logical to assume a casual relationship in the case of BL. Preliminary results obtained in Singapore indicate that Chinese (at high risk for NPC) have a greater proportion of high complement-fixing titers than Indians (at low risk). A prospective study is outlined which will test the hypothesis that no causal relationship exists between EBV and the development of BL, that BL develops in children with long and heavy exposure to EBV, or that a causal relationship between EBV and BL involves special sequential events between EBV infection and influence of co-factors leading to a long and variable latent period.

5000 THE EPSTEIN-BARR VIRUS (EBV) IN BURKITT'S LYMPHOMA AND NASOPHARYNGEAL CARCINOMA. *(E.)* Henle, W. (Div. Virol., Children's Hosp., Philadelphia, Pa.) and G. Henle. *Ann Clin Lab Sci* 4(2):109-114, 1974.

The oncogenic potential of Epstein-Barr virus (EBV) is discussed. Evidence for an etiologic association between EBV and Burkitt's lymphoma (BL) includes: fingerprints of EBV have been found in nearly every BL biopsy examined; EBV transforms susceptible lymphoid cells into permanently growth lymphoblasts which resemble those initiated with BL cells; fatal lymphproliferative malignancies have been induced in nonhuman primates following the injection of EBV and producer BL cells; and African BL patients differed from control in the titers and spectra of antibodies to the various EBV-related antigens. Changes in the spectra and titers of such antibodies have been found referable to prebeding or subsequent changes in clinical status, thus providing prognostic information. Evidence for an etiologic association between EBA and nasopharyngeal carcinoma (NPC) includes: biopsies regularly contain viral DNA at concentrations similar to those found in BL specimens; viable EBV-producing cells have been obtained *in vitro* by the parainfluenza virus-induced fusion of epitheloid cells with lymphoblasts from producer lines; and the titers and spectra of antibodies to EBV in NPC patients are related to the total tumor burden. Tests for EBV-related antibodies may provide information on the progression of BL and/or NPC, the likelihood of relapses, and the effectiveness of therapy.

5001 SEGREGATION OF THE EBV-DETERMINED NUCLEAR ANTIGEN (EBNA) IN SOMATIC CELL HYBRIDS DERIVED FROM THE FUSION OF A MOUSE FIBROBLAST AND A HUMAN BURKITT LYMPHOMA LINE. *(E.)* Klein, G. (Karolinska Inst., Stockholm, Sweden), F. Wiener, L. Zech, H. zur Hausen and B. Reedman. *Int J Cancer* 14(1):54-64, 1974.

Four somatic cell hybrids derived from independent fusions between the mouse L-fibroblast subline A9 and the Epstein-Barr virus (EBV)-carrying Burkitt lymphoma line Daudi were studied for the presence of EBV genome, EBV-determined nuclear antigen (EBNA), other EBV-associated antigens, human surface immunoglobulin, and presence of human chromosomes. The number of approximate EBV-genome equivalents, as determined by cRNA/DNA hybridization, differed among the four lines; this number roughly paralleled the number of EBNA-positive nuclei. Thus, a line with an average of 32 genome equivalents/cell contained 50-70% EBNA-positive nuclei and a clone with an average of 7 genome equivalents contained 23% positive nuclei. Of two hybrids with less than 3 EBV genome equivalents, one was completely negative for EBNA and the other contained only 0.5-1.5% positive nuclei. None of the other EBV antigens (viral capsid antigen, early antigen, or membrane antigen) was expressed at any time, either in untreated hybrid cells or after 5-iododeoxyuridine treatment. The hybrids did not carry detectable surface-associated immunoglobulin or EBV receptors. The presence of the EBV genome was coincident with the maintenance of human chromosomes; but the hybrids that had lost detectable viral genomes and EBNA still contained a considerable number of human chromosomes, suggesting that the viral genome may be associated with a few chromosomes only.

5002 LATENT INFECTION AND MALIGNANT LYMPHOMA IN MARMOSETS (*CALLITHRIX JACCHUS*) AFTER INFECTION WITH TWO ONCOGENIC HERPESVIRUSES FROM PRIMATES. *(E.)* Laufs, R. (Hygiene Inst. U. Gottingen, W. Germany), H. Steinke, G. Steinke and D. Petzold. *J Natl Cancer Inst* 53(1):195-199, 1974.

CJ marmosets were infected i.m. with mean tissue culture infective doses ($TCID_{50}$) of two serologically distinct oncogenic herpesviruses from primates: *Herpesvirus saimiri* (HVS) and *herpesvirus ateles*

(HVA). The TCID$_{50}$ was $10^{4.5}$ of cell-free HVS and $10^{2.8}$ of cell-free HVA. HVS regularly caused a latent infection in the experimental animals. The HVS genome in the peripheral white blood cells of the latently infected monkeys was oncogenic and induced malignant lymphomas in CJ marmosets and owl monkeys. In contrast, HVA always caused malignant lymphomas. The latent infection in CJ marmosets infected with HVS did not inhibit multiplication of HVA in the same animal. After double infection with HVS and HVA, CJ marmosets developed malignant lymphomas. Their tumor tissues contained both oncogenic virus genomes, but only the oncogenic viral sequences of HVA caused the malignancy. Although the tumors produced in the doubly infected animals were identical to those produced by HVA alone, the doubly infected animals showed a longer survival time. An hypothesized host-specific factor in the CJ marmosets appeared to interact differently with the two oncogenic herpesviruses of monkeys.

5003 LYMPHOMA IN OWL MONKEYS (*Aotus Trivirgatus*) INOCULATED WITH *Herpesvirus Saimiri*: CLINICAL, HEMATOLOGIC AND PATHOLOGIC FINDINGS. *(E.)* Cicmanec, J. L. (Litton Bionetics, Inc., Kensington, Md.)., W. F. Loeb and M. G. Valerio. *J Med Prim* 3 (1):8-17, 1974.

Thirteen of 18 owl monkeys inoculated i.m. with intact *Herpesvirus saimiri* (HVS) developed lymphomas with a protracted clinical course. Lymphadenopathy and splenomegaly were apparent 40-177 days postinoculation in infected animals surviving 50-203 days. Lymphocytic leukemia was present in 10 of the 13 affected animals, and actively motile lymphocytes were present in the peripheral blood of all affected monkeys. Lymphomas were also induced in both owl monkeys repeatedly inoculated with heat-inactivated HVS, and in two of three monkeys inoculated with HVS-induced lymphoma cells. The animals treated with the heated HVS developed leukemia after approximately the same interval as the monkeys inoculated with the untreated HVS, and the gross and microscopic lesions found at necropsy were also similar. All of the five HSV-inoculated monkeys which did not develop lymphoma had developed antibodies to HVS-associated antigen 14-28 days postinoculation.

5004 HERPESVIRUS ATELES: TRANSFORMATION *IN VITRO* OF MARMOSET SPLENIC LYMPHOCYTES. *(E.)* Falk, L. (Rush-Presbyterian-St. Luke's Med. Cent., Chicago, Ill.), J. Wright, L. Wolfe and F. Deinhardt. *Int J Cancer* 14(2):244-251, 1974.

Splenic lymphocyte cultures derived from white-lipped marmosets were co-cultivated with x-irradiated *Herpesvirus ateles* (HVA)-carrying lymphoblastoid cells (1022). These cultures were compared with parallel cultures of x-irradiated 1022 cells. Four lymphoblastoid cell lines were established by the transformation of the marmoset splenic lymphocytes with HVA following co-cultivation with 1022 cells. Infectious HVA was recovered from the cell-culture fluids of these cell lines, infectious centers were formed in monolayers of permissive cells after co-cultivation with the transformed lymphoblastoid cells, and a small number of HVA antigen-containing cells was observed in each transformed cell line by indirect immunofluorescence staining with serum containing antibodies to HVA or *Herpesvirus saimiri* (HVS). The x-irradiated 1022 cells failed to grow when cultured alone, no viable cells being detected 4 wk after irradiation. All of the transformed lymphocytes of one line (derived from a female marmoset) contained XX chromosomes, whereas all of the 1022 cells had the XY karyotype. The cells of another line (derived from a hematopoietic chimeric marmoset of a male-female twin pair) contained XX or XY chromosomes. Intranuclear inclusion bodies were observed in three cultures examined, but herpesvirus virions were observed in only one of three cell lines. All four cultures had the properties of T-lymphocytes, i.e., they formed rosettes with sheep erythrocytes and had no detectable membrane immunoglobulins. Comparison of the transformed cells to marmoset lymphoblastoid cells carrying HVS or Epstein-Barr virus (EBV) showed some antigenic differences as well as differences in the ability to replicate in vero cell cultures.

5005 RESISTANCE OF FEMALE MICE TO VAGINAL INFECTION INDUCED BY *HERPESVIRUS HOMINIS* TYPE 2: EFFECTS OF IMMUNIZATION WITH *MYCOBACTERIUM BOVIS*, INTRAVENOUS INJECTION OF SPECIFIC *HERPESVIRUS HOMINIS* TYPE 2 ANTISERUM AND A COMBINATION OF THESE PROCEDURES. *(E.)* Baker, M. B. (Dep. Microbiol., Univ. Montana, Missoula), C. L. Larson, R. N. Ushijima and F. D. Anderson. *Infect Immun* 10(6):1230-1234, 1974.

The effects of nonspecific immunity induced by vaccination with *Mycobacterium bovis* (BCG), passive administration of specific *Herpesvirus hominis* type 2 antiserum, and a combination of these procedures upon the course of *Herpesvirus hominis* type 2-induced vaginitis was investigated in four- to six-week old female white Swiss mice. Sterile absorbent cotton pellets 3-4 mm in diameter were saturated with 0.05 ml of the virus suspension and immediately inserted into the vagina. The highest dose of virus administered contained 7.5×10^4 mean tissue culture infective doses/0.05 ml. Innoculated mice developed vaginitis, posterior paralysis, encephalitis, and death. Prior immunization with BCG (10^7 viable BCG bacilli i.v.) either had no effect of appeared in some cases to enhance the course of the disease, whereas a single 0.5 ml i.v. injection of antiserum provided significant protection. Synergistic interaction of BCG immunization and treatment with antiserum produced the greatest degree of protection in mice challenged intravaginally with *Herpesvirus hominis* type 2. It is concluded that protection in mice against vaginal inoculation with *Herpesvirus hominis* type 2 is dependent upon stimulation of the reticuloendothelial system as well as the presence of specific antibodies.

5006 SELECTIVE INHIBITION OF RNA TUMOR VIRUS FUNCTION. *(E.)* Carter, W. A. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.), E. C. Dorden, W. W. Brockman, D. Byrd, W. Ligon, F. Antosz and K. L. Rinehart, Jr. *Collect Pap Annu Symp Fundam Cancer Res* 25:303-307, 1974.

Streptovaricins A through G, together with the original complex, were tested for inhibitory activity on DNA synthesis in an *in vitro* system using reverse transcriptase and resident RNA from mouse leukemia virus. At a streptovaricin concentration of 200 μg/ml and under conditions of incubation of 50 minutes, the levels of inhibition for the test materials were 0, 68, 45, 92, 0, 0, 92, and 92%, respectively. Furthermore, streptovaricin D and the complex both reduced the formation of murine sarcoma virus-induced tumor foci *in vitro* at concentrations that did not slow the division rate of normal cells. Additional inhibition of transformation was achieved by concomitant inhibition of viral protein synthesis with interferon. Finally, continuous feeding of streptovaricin to Rauscher leukemia-infected mice starting 24 hr prior to infection resulted in the development of significantly smaller spleens, while uninfected mice given streptovaricin showed no change in spleen weight. This finding, together with the observation of lack of effect of streptovaricin on mice bearing the carcinogen-induced L1210 lymphoma, suggested a specific blockade of viral function by the antibiotic. Streptovaricins A and C were as effective *in vivo* as the streptovaricin complex, indicating possible biotransformation *in vivo*. The results indicated that inhibition of reverse transcriptase can be effected by streptovaricin without a measurable disturbance of normal cell function.

5007 C-TYPE RNA TUMOR VIRUS IN WILD HOUSE MICE (*MUS MUSCULUS*). *(E.)* Gardner, M. B. (U. Southern California Sch. Med., Los Angeles), J. E. Officer, R. W. Rongey, H. P. Charman, J. W. Hartley, J. D. Estes and R. J. Huebner. *Bibl Haematol* (39): 335-344, 1973.

C-type virus particles and group-specific (gs) antigen were detected in low titer and low prevalence in spleens and livers of adult wild mice sampled promptly after trapping. A similar low prevalence of C-type particles and gs antigen was also observed in methylcholantrene (MC)-induced tumors and corresponding spleen and in spleens from trioctanion-injected controls. A much higher prevalence (about 80%) of C-type particles and species specific gs antigen (titer, 1:4-1:16) was found in spontaneous lymphomas of aging mice. None of the tumor-bearing mice had detectable complement-fixing antibodies to the murine C-type virus gs antigen or to lymphocytic choriomeningitis or polyoma viral antigens. None of the spontaneous lymphomas contained polyoma T or V antigen or polyoma particles by electron microscopy. Infectious C-type leukemia or sarcoma viruses could not be isolated *in vitro* from the MC-induced sarcomas and spontaneous lymphomas. However, infectious C-type murine leukemia virus was recovered *in vitro* from two wild mouse embryo cell cultures and directly from the mother of one of these embryos. That these C-type viruses from wild mice belong to the murine leukemia group is indicated by the *in vitro* transforming capacity, their characteristic C-type morphology, the 1.16 g/ml buoyant density of the banded virus on sucrose gradients, possession of the species-specific gs-1 antigen, and presence in the banded virions of RNA-dependent DNA polymerase activity. These findings suggest that, as in laboratory mice, the C-type tumor viruses of wild mice do not spread horizontally but an occasional mother may pass C-type virus to her off-spring *in utero*.

5008 INTRACELLULAR VIRAL RNA SPECIES IN MOUSE CELLS NONPRODUCTIVELY TRANSFORMED BY THE MURINE SARCOMA VIRUS. *(E.)* Tsuchida, N. (St. Louis Univ. Sch. Med., Mo.) and M. Green. *J Virol* 14(3): 587-591, 1974.

The virus-specific RNA in five nonvirus-producing mouse cells transformed by the Moloney isolate of the murine sarcoma virus (MSV) was studied. Hybridization of the RNA from the transformed cells with the ^{3}H-DNA product of the RNA-directed DNA polymerase of the murine sarcoma-leukemia virus was used to detect and quantitate the virus-specific RNA. The amount of virus-specific RNA in the nonvirus producing cells was less than 1/6 of that found in the virus-producing cells. A striking correlation was found between the amount of intracellular virus-specific RNA and the degree of agglutination by concanavallin A previously reported for the four nonvirus-producing NIH/3T3 cell lines. A major RNA subunit sedimenting at 26-28*S* was detected in all five MSV-transformed nonvirus producing cells. This could represent the RNA genome of the defective MSV. The extent of transcription of the viral genome may influence the surface properties of the transformed cell.

5009 EFFECT OF TISSUE INJURY ON TUMORIGENESIS INDUCED BY MURINE SARCOMA VIRUS (HARVEY). *(E.)* Thomas, W. R. (Perth Med. Ctr., Australia), E. J. Aw, J. M. Papadimitriou and P. J. Simons. *J Natl Cancer Inst* 53(3):763-766, 1974.

Murine sarcoma virus-Harvey (MSV-H) rapidly induced tumors at the site of inoculation when injected i.m. into newborn BALB/c mice. Adult BALB/c mice rarely developed tumors after MSV-H inoculation. If the issue at the inoculation site was injured 2 days before MSV-H injection, almost all adult mice developed tumors. These tumors histologically resembled the lesions induced by MSV-H in newborn mice. Although most tumors produced in adult mice after tissue injury and MSV-H inoculation ultimately regressed, they grew progressively if induced in x-irradiated animals. Tissue injury at a site distant from the virus inoculation did not enhance tumor growth.

5010 ISOLATION AND CHARACTERIZATION OF THE HAMSTER C-TYPE VIRUSES. *(E.)* Kelloff, G. J. (Natl. Cancer Inst., Bethesda, Md.), R. J. Huebner and R. V. Gilden. *Bibl Haematol* (39):61-68, 1973.

Newborn hamsters were inoculated with tissue culture-grown murine sarcoma viruses [M-MSV(GLV), M-MSV, and Ki-MSV] in doses of $10^{3.5}$ to 10^5 focus-forming U/animal. The latent period for development of the first tumors averaged 9 months; after several hamster transplant passages, cell-free viral concentrates of these tumors were sarcomagenic in hamsters. With cell-free passages these preparations became increasingly oncogenic for hamsters but were not oncogenic for mice. Foci induced by these three new viruses [M-MSV(HaLV), M-MSV(HaLV), and Ki-MSV-(HaLV)] on hamster embryo fibroblasts were similar to those observed on embryo fibroblasts inoculated with avian and murine sarcoma viruses. The complete change in host range of the new isolates from their precursor murine sarcoma viruses suggested the presence of a hamster-specific helper virus. Such a virus was isolated from each of the hamster sarcoma virus stocks by endpoint dilution and cloning techniques. The major structural polypeptide of the helper virus was purified by isoelectric focusing or acrylamide gel electrophoresis, and specific antisera prepared against it. This group-specific antigen is shared by the hamster helper viruses, the hamster sarcoma viruses, and the C-type particles found in spontaneous and chemically induced hamster tumors. This antiserum does not react with murine C-type viruses. It appears certain that the hamster helper virus represents the indigenous C-type virus of the hamster; its isolation was facilitated by the input defective murine sarcoma virus(es).

5011 STUDIES ON THE TYPE C VIRAL REPLICATION DEFECT IN MSV-TRANSFORMED RAT NONPRODUCER VARIANT CLONES.

(E.) Desai, L. (Peter Bent Brigham Hosp., Boston, Mass.) and D. M. Livingston. *Virology* 62(2):337-343, 1974.

Two clonal derivatives of a murine sarcoma virus-transformed rat cell line, K-NRK Cl 32, were previously found to be both relatively contact inhibited and nonpermissive for type-C virus replication, unlike the parental cell. In the present study, the infectivity of vesicular stomatitis virus (VSV) and its Kirsten murine leukemia virus pseudotype [VSV(KiMuLV)] was compared on the two variants and the parental clone. All three cell lines were equally permissive for VSV but, compared with K-NRK Cl 32, both variants were nonpermissive for VS(KiMuLV). The data strongly suggest that both subclones are defective in the processes of type-C virus adsorption, penetration, and/or uncoating. The possibility that a membrane-associated functional defect might underlie these phenomena is suggested.

5012 ADENYLATE CYCLASE ACTIVITY IN FIBROBLASTS TRANSFORMED BY KIRSTEN OR MOLONEY SARCOMA VIRUSES: DECREASED ACTIVITY AND LOSS OF RESPONSE TO PROSTAGLANDIN E_1.

(E.) Anderson, W. B. (Natl. Cancer Inst., Bethesda, Md.), M. Gallo and I. Pastan. *J Biol Chem* 249(22):7041-7048, 1974.

The activity of adenylate cyclase was studied in normal rat kidney (NRK) cells and NRK cells transformed by either the Kirsten sarcoma virus (Ki-SV) or the Moloney sarcoma virus (Mo-SV). The specific activity of the NRK enzyme increases with increasing cell population density. Transformation apparently decreases this response in that the cyclase activity of cells transformed by Ki-SV (KNRK) is low and rises only slightly with increasing cell density. The activity in transformed cells never exceeds 50% that in confluent NRK cells. Further, when assayed in the presence of 10 mM NaE, the activity in KNRK and Mo-SV transformed cells (MNRK) is appreciably lower than that from NRK cells. The enzymes from all three cell types exhibited an apparent K_m (ATP) of about 0.24 mM; thus the changes in adenylate cyclase activity are not due to an altered affinity for ATP. The activity of the NRK enzyme increases with increasing Mg^{2+} concentration through 15 mM; the enzyme from KNRK and MNRK cells is saturated at 1 mM Mg^{2+}. When assayed in the presence of Mn^{2+}, the cyclase activity of KNRK and MNRK cells is decreased relative to NRK cells. The adenylate cyclase of NRK homogenates is stimulated 2- to 3-fold by prostaglandin E_1; guanosine triphosphate (GTP) has little effect on either basal or prostaglandin E_1-stimulated activity. However, the activity of crude, washed NRK membranes is enhanced 2- to 3-fold by GTP at 10^{-6} to 10^{-4} M. Stimulation by prostaglandin E_1 is dependent on the presence of GTP in the preparation. The cyclase from KNRK and MNRK homogenates and membrane preparations is unresponsive to prostaglandin E_1 in either the presence or absence of GTP. Thus, the transformation of fibroblasts with RNA tumor viruses often results in decreased adenylate cyclase activity, the mechanism of reduction appearing to differ with different viruses.

5013 SARCOMA AND HELPER-SPECIFIC RNA TUMOR VIRUS SUBUNITS IN TRANSFORMED NONPRODUCER MOUSE CELLS ACTIVATED TO PRODUCE VIRUS BY TREATMENT WITH BROMODEOXYURIDINE.

(E.) Tsuchida, N. (Flow Lab., Inc., Rockville, Md.), M. S. Shih, R. V. Gilden and M. Hatanaka. *J Virol* 14(5):1262-1267, 1974.

A tumor line (58-2T) was established from a slowly growing tumor in a BALB/c mouse inoculated with M58-2 cells. The latter clonal cell line was isolated as a flat variant by 5-bromodeoxyuridine treatment of nonproducer BALB/3T3 cells transformed by Kirsten sarcoma virus (KiSV). The 58-2T cells produced type-C virus with two discrete virus-specific RNA species. The first species, which was probably an endogenous virus RNA subunit, had a sedimentation coefficient of 35S as the largest major subunit; based on nucleic acid hybridization, it had sequences similar to Rauscher leukemia virus (RLV) RNA. The second RNA species had 30S as the largest major subunit and corresponded to KiSV-specific RNA. These two RNA species formed heterogenous, 60-70S, high-molecular wt RNA in virions. DNA transcripts (58-2T DNA) from the activated virus contained base sequences complementary to RLV and KiSV. The KiSV-specific DNA sequences (58-2TS) were purified from 58-2T DNA by eliminating RLV-specific sequences.

5014 MAMMARY CARCINOGENESIS IN FOSTER-NURSED X/Gf MICE.

(E.) Goldfeder, A. (Delafield Hosp., New York, N.Y.) and A. K. Ghosh. *Cancer Res* 34(9):2184-2191, 1974.

Newborn X/Gf mice were foster nursed by mothers of the DBA/212 mouse strain. The X/Gf mice are highly resistant to the spontaneous development of mammary tumors, whereas DBA/212 mice develop mammary tumors at high rates and contain an abundance of the mammary tumor virus [MMTV] . Varied numbers of F_1 to F_7 generations of foster-nursed females produced mammary tumors at ages from 12-24 months. Sections of the tumors stained with hematoxylin and eosin and studied by light microscopy showed the characteristic appearance of mammary carcinomas, although differing in degree of differentiation. Electron microscopic studies revealed the characteristic type MMTV particles in the tumors. Morphologically, the virus particles in X/Gf mammary tumors appeared identical to those seen in spontaneous mammary tumors of the DBA/212 foster mothers. Separate biochemical studies on molecular level of growing X/Gf tumor extracts revealed viral-specific high-molecular-weight 70 S RNA and reverse transcriptase; the putative viral complex was localized in sucrose gradients at a density of 1.16 g/ml, the position characteristic of RNA MMTV. Thus, the electron microscopic and biochemical data on a molecular level provide documentary evidence of the infectivity of the MMTV in the host cells. X/Gf mice, challenged with MMTV by foster nursing, produced mammary tumors in early generations but failed to develop tumors after the seventh generation. This suggests that the X/Gf host, known to generate high levels of antibodies against MMTV, may be responsible for the cessation of mammary tumor development and not the virus. The significance of the immune competence of the host in neoplasia thus becomes apparent.

5015 RNA-DEPENDENT DNA POLYMERASE IN PRENEOPLASTIC NODULES AND TUMORS OF THE MAMMARY GLAND OF BALB/c MICE. *(E.)* Mukherjee, A. S. (Tumor Biol. Lab., U. Nebraska-Lincoln) and M. R. Banerjee. *J Natl Cancer Inst* 53(3):817-824, 1974.

Normal mammary tissue, preneoplastic nodules D1 and D8 of mouse mammary tumor virus (muMTV)-free BALB/c mice, an muMTV-positive D1 nodule, and the mammary neoplasms derived from each of these nodules were analyzed for RNA-dependent DNA polymerase (RDDP). In addition, 3-methylcholanthrene (MCA)-induced mammary tumors of BALB/c mice and muMTV-induced neoplasms of C3H mice were examined. The enzyme from the high-speed supernatant of tissue homogenate was purified by diethylaminoethyl-cellulose column chromatography by elution with a 0.05-0.7 M KCl gradient. RDDP was assayed *in vitro* at 37 C in a standard mixture containing Mg^{++} and dithiothreitol (DTT). The reaction was monitored by the rate of ^3H-dTTP incorporation in an acid-insoluble fraction. Various synthetic polynucleotides and calf liver RNA were used as templates. RDDP was negligible in the mammary tissue of pregnant mice, modestly active in the D1 nodule, but highly active in the muMTV-free D8 and the muMTV-positive D1 nodules. In addition, it was extremely active in mammary neoplasms with or without muMTV, including the MCA-induced tumor. The enzyme from most tissues preferentially utilized poly $rA \cdot dT_{10}$ and calf liver RNA as templates. However, the D1-muMTV nodule enzyme had a poor affinity for the biologic RNA template and the enzyme from the MCA-induced tumor failed to use the same template. Prior treatment of the template with pancreatic and T_1 (*Aspergillus oryzae*) RNAse abolished the activity, and the reaction was sensitive to dimethylbenzyldemethyl rifampicin. The reaction product was sensitive to DNAse but resistant to RNAse and NaOH. These results indicate the presence of an RDDP in muMTV-free mammary nodules and tumors. When the two virus-free nodules were compared, the RDDP activity was more pronounced in the lesion with a greater tumor potential.

5016 DISTRIBUTION OF VIRUS PARTICLES AND MAMMARY TUMOR VIRUS ANTIGENS IN MOUSE MAMMARY TUMORS, TRANSFORMED BALB/c MOUSE KIDNEY CELLS, AND GR ASCITES LEUKEMIA CELLS. *(E.)* Calafat, J. (Netherlands Cancer Inst., Amsterdam), F. Buijs, P. C. Hageman, J. Links, J. Hilgers and A. Hekman. *J Natl Cancer Inst* 53(4):977-991, 1974.

The distribution of virus particles and mammary tumor virus antigens was investigated in mammary tumor cells from BALB/c mice infected with mammary tumor virus (MTV), baby BALB/c mouse kidney cells (BMK) transformed with 3-methylcholanthrene (A_3 cell line) or MTV (A_5 cell line), and GR mouse ascites leukemia cells (GRSL). B and C particles, as well as budding particles, were observed in A_3 and A_5 cells; the number of B particles decreased and the number of C particles increased after several passages. During early transplant generations of GRSL cells, only intracytoplasmic A particles and some budding particles were seen; after one yr of transplantation, mature B and C particles were observed. Immunoferritin labeling with rabbit anti-MTV serum showed that the distribution of MTV antigens was similar in the four types of cells; budding, immature, and mature B particles were labeled. In addition, labeled MTV antigens were found in small distinct areas over the whole surface of unpolarized cells. When cells were polarized, as shown by increased membrane activity (formation of pseudopodia and microvilli) at one pole, the label was more abundant and density packed at this pole. The presence of B and C particles in the chemically transformed BNK cells confirms the existence of an endogenous MTV and murine leukemia virus in BALB/c mice.

5017 ISOLATION AND PASSAGE OF MAREK'S DISEASE VIRUS IN CELL CULTURES. *(Rus.)* Iakovleva, L. S. (Inst. Exp. Clin. Oncol., Moscow, USSR), N. K. Gunenkova, I. Iu. Cherniakhovskaia and N. P. Mazurenko. *Vopr Virusol* (2):184-189, 1974.

After 9 passages in chicks, Marek's disease virus (MDV), Kekava strain, produced a cytopathic effect (CPE) in hen kidney and chick embryo kidney cell cultures (HKC and CEKC). The cells in the area of a CPE plaque contained virus-specific immunofluorescen antigen. The CPE in cell cultures was produced by all of the examined filtrates of extracts of feather follicles and by over half of the specimens of kidneys and blood of hens with signs of Marek's disease. The specimens taken from the hens with no signs of the disease but infected with MDV-Kekava virus revealed the presence of the virus in fewer instances. A similar CPE was produced in CEKC cultures by half of the spleen cell and blood specimens from the fowl under examination. Passages of MDV in HKC and CEKC resulted in the attenuation of CPE by the 3d-7th passage. In chick fibroblast (CF) or duck fibroblast (DF) cultures MDV produced no CPE. However, the presence of the virus in CF and DF cultures cannot be ruled out since injection of chickens with virus from the 1st-3d passages in this culture produced the disease, while cultures of later passages contained virus-specific antigen.

5018 DEOXYRIBONUCLEIC ACID OF MAREK'S DISEASE VIRUS IN A LYMPHOBLASTOID CELL LINE FROM MAREK'S DISEASE TUMOURS.

(E.) Nazerian, K. (Agric. Res. Serv. Reg. Poult. Res. Lab., East Lansing, Mich.) and L. F. Lee. *J Gen Virol* 25(2):317-321, 1974.

DNA extracted from a chicken lymphoblastoid cell line (MSB-I) originally derived from a Marek's disease tumor was examined for the presence of Marek's disease virus genome. Marek's disease virus strain GA was used for DNA preparation and Marek's disease virus complementary RNA preparation. DNA-complementary RNA filter membrane hybridization experiments established the presence of 60 to 90 genome equivalents/MSB-I cell. It is concluded that these results provide further evidence for the role of Marek's disease virus DNA in *in vitro* transformation of chicken lymphoid cells. The status of Marek's disease virus DNA and its association with host cell DNA is not known.

5019 THE POSSIBILITY OF VERTICAL TRANSMISSION OF ONCORNAVIRUSES IN HUMANS.

(Rus.) Bocharov, A. F. (D. I. Ivanovskii Inst. Virol., Moscow, USSR), G. A. Delimbetova and V. M. Zhdanov. *Vopr Virol* (2):223-226, 1974.

Electron microscopic studies were carried out on trypsinized primary kidney tissue from a 6-month-old human embryo in an attempt to find oncornaviruses in human embryonic tissues. A study of ultrathin sections revealed virions of types A, B and C. Type A virions were located in the cellular cytoplasm and were bonded to the vacuolar structures. The low-density central part did not contain a nucleoid. Types B and C were located extracellularly. Type B virions had 30-40 nm nucleoids made up of dense granules. Type C virions had 42-122 nm nucleoids of average density. The results indicate that the structures and sizes of A, B and C virions found in the experiment corresponded to those of known oncornaviruses of vertebrates. The data obtained suggest the possible vertical transmission of oncornaviruses from mother to child during embryonic development.

5020 ELECTROPHORETIC STUDY OF VIRAL PROTEINS IN J-96 LYMPHOBLAST CELLS.

(Rus.) Zhdanov, V. M. (Cent. Inst. Postgrad. Med., Moscow, USSR), T. A. Bektemirov, Iu. S. Derkach, V. Ia. Kitsak and F. P. Filatov. *Vopr Virusol* (5):596-599, 1974.

Protein components of oncornavirus from J-96 lymphoblast cells were investigated electrophoretically in a polyacrylamide gel. The virus was labelled with a ^{14}C-amino acid mixture and was treated with a nonionic NP-40 detergent after concentration and purification in 20-60% sucrose density gradient. Centrifuging of the virus in a cesium chloride gradient resulted in localization of the label in the 1.27 g/ml and 1.32-1.34 g/ml bands. Electrophoresis of the samples from the peaks in the polyacrylamide gel with sodium dodecylsulphate showed that the number of main proteins decreased from six to eight in the band with a density of 1.27 g/ml to two in the 1.32-1.34 g/ml band. This decrease in the number of protein components detected in subviral structures during disintegration of the virions is apparently related to removal of the outer membrane of the virions and their structural proteins. It was established that the molecular weight of the nucleoid was 3.3-3.5 x 10^4 daltons.

5021 OBSERVATION OF ONCORNAVIRUS IN CELL CULTURES OF TISSUE FROM CATTLE WITH LEUKEMIA.

(Rus.) Parfanovich, M. I. (No affiliation), A. E. Baranov, N. F. Kazak, L. A. Lebedenko, T. A. Nikol'skaia, L. L. Fadeeva, V. N. Siurin and V. M. Zhdanov. *Veterinariia* (4):47-49, 1974.

Trypsinized cell cultures were prepared from the lymph nodes, spleen, and kidneys of six cows with clinically diagnosed acute and chronic leukemia. The labeled liquid phase was collected 24 hr after addition of ^{3}H-uridine to cultures, cells were removed by centrifugation, and virus was precipitated from the supernatant at 80,000 g and placed in a sucrose density gradient. Reverse transcriptase activity was studied along with the degree of complementarity of ^{3}H-RNA and DNA from lymph node cells of healthy and leukemic cows. A virus with physicochemical properties characteristic of oncornaviruses was present in these cultures. It had a buoyant density of 1.14-1.18 g/ml, was induced by 5-bromodeoxyuridine (100 μg/ml), had reverse transcriptase activity and contained 60S RNA which was complementary in a hybridization reaction with DNA from lymph nodes of leukemic cows. A definite conclusion about the etiological role of the viruses isolated from cattle with leukemia may be reached only after a series of additional virological, immunological, and molecular-biological studies.

5022 ONCORNA TYPE VIRUS PARTICLES IN A TUMOR OF A RHESUS MONKEY.

(E.) Chopra, H. C. (Natl. Cancer Inst., Bethesda, Md.). *Bibl Haematol* (39):228-235, 1973.

A new virus isolated from a spontaneous tumor of a rhesus monkey has the biophysical and biochemical properties of the known oncogenic RNA viruses. The virus exhibits the morphology of both type B particles of mouse mammary cancer and type C particles of the leukemia-sarcoma complex. It develops intracytoplasmically in the form of type A particles, the precursor of type B particles, but the extracellular virus resembles type C in that it consists of centric nucleoid and is devoid of surface spikes of type B particles. During long-term *in vitro* propagation, the virus not only develops in a pattern similar to that of type B particles, but the extracellular virus demonstrates eccentric nucleoids resembling type B particles of mouse mammary cancer. It has been propagated in monkey, chimpanzee, and human cells. The virus contains five soluble antigens: three with the viral envelope and two with the internal component. It bands at 1.16 g/ml, consists of 60-70S RNA species, and contains RNA-instructed DNA polymerase. Serologically, the virus is unrelated to the simian foamy viruses and other oncogenic viruses.

5023 RNA POLYMERASE ACTIVITY IN ONCORNAVIRUS VIRIONS AND ITS RELATION TO REVERSE TRANSCRIPTION. *(Rus.)* Perevozchikov, A. P. (N. N. Petrov Inst. Oncol., Leningrad, USSR), Iu. P. Zerov, G. F. Pluzhnikova, E. A. Ratovitskii, M. N. Kiprianova, P. G. Kniazev and I. F. Seits. *Dokl Akad Nauk SSSR* 219(3):752-755, 1974.

Studies were carried out on the interaction of RNA- and DNA-polymerase in the virions of Rous sarcoma virus (RSV) and avian myeloblastosis virus (AMV). RNA-free protein preparations of the virus were isolated by solubilization of the enzymes by treating sucrose-purified (15-60%) virions with Triton-X100, followed by the purification of the degradation products of endogenous RNA by gel-filtration on Sephadex G-75. The addition of nucleoside triphosphates (NTP) and dNTP to the reaction mixture resulted in the incorporation of the label both in RNA and DNA. The addition of exogenous RSV RNA to the protein preparation of the virus during the simultaneous synthesis of DNA and RNA resulted in the stimulation of DNA synthesis and the inhibition of RNA synthesis. It was assumed that the relations of RNA- and DNA-polymerase activities depended on whether homologous or heterologous RNA was used as the template, the former producing a cooperative action of the enzymes, and the latter a competitive action for the use of RNA. The action of individual NTP on the reverse transcription was also studied to determine the role of various ribonucleoside triphosphates in DNA synthesis. In the case of AMV, DNA synthesis was stimulated by ATP alone as well as by all 4 NTPs (in equimolar quantities). In the case of RSV, DNA synthesis was stimulated only by the addition of all 4 NTPs, while individual NTPs tended to inhibit DNA synthesis.

5024 PROPERTIES OF INTRACYTOPLASMIC A PARTICLES ISOLATED FROM ONCORNAVIRUS-PRODUCING HUMAN CELLS. *(E.)* Bukrinskaya, A. G. (D. I. Ivanovsky Inst. Virol., Moscow, USSR), G. G. Miller, E. N. Lebedeva, L. V. Agaphonova, N. N. Masurenko and K. V. Ilyin. *J Virol* 14(4):924-933, 1974.

A particles (80-90 nm in diameter) were isolated from the cytoplasm of human HEp-2, HeLa, and AO cells producing Mason-Pfizer type oncornavirus. From 90-97% of the particles banded at 1.23-1.24 in equilibrium sucrose gradients, the rest banding at 1.29 g/ml. In CsCL gradients the particles banded at 1.30 g/ml, indicating that they contained 8% RNA. Individual A particles sedimented at 200-250S in velocity sucrose gradients, but a significant portion aggregated and sedimented at more than 300S. The particles were resistant to RNase digestion. They possessed polymerase activity which was preferentially activated by Mn^{2+} rather than by Mg^{2+}, the RNA template being 60S RNA. Cross-hybridization with two DNA products and immunoassay showed that the A particles and the Mason-Pfizer-like virus produced by the same cells contained neither homologous RNA sequences nor common antigens. This suggests that the particles are not intracellular precursors of Mason-Pfizer-like oncornavirus but represent an independent oncornavirus. Hybridization of A particle RNA with excess cellular DNA revealed about 20 proviral copies/HEp-2 genome and no proviral copies in human embryo and placenta cell genomes. Thus, the suggestion that A particles represent some putative human endogeneous virus was not confirmed.

5025 INTRACELLULAR ACCUMULATION OF ONCORNAVIRUSES IN CONTINUOUS HUMAN CELL LINES. *(E.)* Zhdanov, V. M. (D. I. Ivanovsky Inst. Virol., Moscow, USSR), T. F. Lozinsky, M. Y. Volkova, U. A. Abenova, N. N. Mazurenko, G. C. Miller, K. V. Ilyin, I. S. Irlin, S. M. Klimenko and A. F. Bykovsky. *Neoplasma* 21(3):257-265, 1974.

Virions from six continuous human cell lines producing B-type oncornaviruses (HEp2, HeLa, DAPT, RH, Al, and Detroit 6) were studied using electron microscopy, immunodiffusion, and assays of reverse transcriptase activity. Electron microscopy regularly revealed extracellular B-and A-type particles in the cultures. The cultures also released structures which banded at the sucrose density characteristic for oncornaviruses (1.16-1.17 g/ml). Treatment with low concentrations of actinomycin D prevented the production of these structures. The reverse transcriptase reaction with an exogenous template was also positive. These results could not be regularly reproduced. Intracellular A-type particles were regularly observed, as was reverse transcriptase activity associated with 70S RNA. Antigens prepared from all six cultures reacted with the serum obtained by immunization of rabbits with the purified virus from HEp2 culture. The extracellular and intracellular antigens from the cultures studied were identical, with the intracellular antigens giving stronger reactions than the extracellular antigens. Antigens were present in all cell fractions except the supernatant after centrifugation at 150,000 g. The reactions became positive after ether treatment, indicating that the antigens were not in a free soluble form but in virus-specific structures.

5026 PERSISTENT INHIBITION OF CELL PROLIFERATION BY ONCOGENIC POLYOMA VIRUS IN RATS. *(Ger.)* Zobl, H. (Med. Coll., Hanover, Germany), G. Siegismund, A. Georgii, W. Lang and D. Stoyvesandt. *Virchows Arch [Zellpathol]* 16(3):281-295, 1974.

Persistent inhibition of cell proliferation by oncogenic polyoma virus was studied in intact and thymectomized newborn and young adult Wistar rats and NMRI mice by using histoautoradiography and ^3H-thymidine injections. Dose-dependent induction of renal sarcomas by polyoma virus was observed. Renal tumors developed in 56% of neonatally infected rats and in 84% of neonatally infected thymectomized rats. No tumors occurred in adult rats or in any of the mice infected with polyoma virus. A significant reduction of DNA-synthetizing cells occurred prior to the onset of tumor cell proliferation in the liver and kidneys. Reduced cell proliferation manifested itself by a decreased mitotic index, while grain counts following administration of ^{3}H-thymidine remained unchanged. The greatest inhibition of DNA synthesis occurred in the target cells of polyoma virus, i.e., the stromal cells of the kidney. DNA synthesis was also inhibited in the renal tubular cells and in epithelial and stromal cells of the liver, while the rapidly regenerating duodenal mucosa was spared from the inhibitory effect of polyoma virus. Inhibition lasted for at least 30 days after virus infection and was observed even in rats that developed no tumors. Since the inhibitory effect was especially pronounced in thymectomized rats and the inhibition was accompanied by a reduction of the mitotic index, the synthesis of viral antigens is believed to be responsible for inhibition of DNA synthesis. Polyoma virus caused no chromosomal aberrations at all. No changes in DNA synthesis occurred in the liver, kidneys or duodenum of polyoma-infected mice.

5027 *IN VITRO* POLYOMA DNA SYNTHESIS: STUDIES ON AN EARLY TEMPERATURE-SENSITIVE MUTANT.

(E.) Francke, B. (Salk Inst. Biol. Studies, San Diego, Calif.) and T. Hunter. *J Virol* 13(1):241-243, 1974.

An *in vitro* DNA-synthesizing system from polyoma-infected BALB/3T3 cells was used to examine possible differences between ts25 (a member of the ts-a class of early mutants of the polyoma virus) and ts1260 (a late mutant which makes normal amounts of viral DNA at the nonpermissive temperature, 39 C). The time course of incorporation of ^{3}H-TTP into viral and cellular DNA *in vitro* at 32 and 39 C by lysates derived from ts1260- and ts25-infected BALB/3T3 cells indicated that the shift to 39 C drastically reduced the incorporation into the viral DNA fraction in the case of the ts25 infection; lysates from ts25-infected cells shifted to 39 C for 2 hr did not spontaneously recover and synthesize viral DNA when incubated at 32 C. There was no shutoff in viral DNA synthesis when lysates from ts25-infected cells maintained at 32 C were incubated at 39 C. The extent of cellular DNA synthesis in lysates from ts25-infected cells was the same whether or not a shift to the nonpermissive temperature had been made. The temperature dependence of DNA chain elongation was the same in ts25- and ts1260-infected cell lysates: the mechanisms for discontinuous growth were also identical for both mutants.

5028 EFFECT OF INHIBITORS OF PROTEOLYTIC ENZYMES ON THE GROWTH OF NORMAL AND POLYOMA TRANSFORMED BHK CELLS.

(E.) McIlhinney, A. (Sch. Biol. Sci., U. Sussex, Brighton, England) and B. L. M. Hogan. *Biochem Biophys Res Commun* 60(1):348-354, 1974.

The effects of proteolytic enzyme inhibitors (tosylphenylalanyl-chloromethyl ketone (TPCK), Pepstatin, Antipain, Leupeptin, and Trasylol) on the growth and morphology of normal and polyoma transformed baby hamster kidney (BHK) cells was studied *in vitro*. TPCK inhibited the growth of both normal and polyoma-transformed BHK cells, although at concentrations above 10 μm the normal cells were somewhat more resistant. TPCK also inhibited the incorporation of leucine into protein in both the normal and transformed cells. Pepstatin (0.1-0.5 μg/ml) had no differential effect on normal and transformed BHK cells. Pepstatin (0.5 μg/ml) and Antipain (10-50 μg/ml) reduced the plating efficiency of BHK cells by 20%. Leupeptin (10-50 μg/ml) had a preferential inhibitory effect on the growth of normal BHK cells compared with transformed cells; this difference was also observed in the 1-5 μg/ml concentration range. Leupeptin (30 μg/ml) reduced the plating efficiency of BHK cells by 34%. Trasylol (100-1000 U/ml) also inhibited the growth of normal cells more effectively than that of transformed cells. The results do not support the hypothesis that the growth of transformed cells is stimulated autocatalytically by proteolytic enzymes.

5029 CHARACTERIZATION OF THE RNA INITIATING THE DISCONTINUOUS SYNTHESIS OF POLYOMA DNA.

(E.) Eliasson, R. (Karolinska Inst., Stockholm, Sweden), R. Martin and P. Reichard. *Biochem Biophys Res Commun* 59(1):307-313, 1974.

Initiating RNA from polyoma virus-infected 3T6 cells was labeled with ^{3}H-guanosine-5'-triphosphate (GTP), while the DNA progeny strands were labeled with α-^{32}P deoxycytidine-5'-triphosphate (CTP). After alkaline hydrolysis, the distribution of ^{3}H between pppGp (= GTP, 2'(3')monophosphate) and guanosine monophosphate (GMP) was used to determine the number of 5' ends of RNA newly synthesized from GTP, relative to the total amount of RNA synthesized. The presence of pppGp in all four classes of progeny strands indicated that the initiating RNA could start with GTP at all stages of replication, while the low GMP/pppGp ratios indicated that the initiating RNA was quite short. When the RNA was released from progeny DNA strands by digestion with pancreatic DNAse and characterized by gel electrophoresis, its position on the gel corresponded approximately to that of a decanucleotide. About 9 molecules of uridine monophosphate were present for each pppGp. The ratio between ATP and GTP at the 5' end of the initiating RNA was 2.5 - 3, indicating a preference for ATP as the starting nucleotide. While the initiating RNA was quite homogenous in size, it had no unique nucleotide sequence.

5030 EARLY CHANGES IN CELLULAR DNA WHEN INCUBATED WITH RNA FROM LEUKEMIC CELLS AND RAUSCHER'S LEUKEMOGENIC VIRUS.

(Rus.) Butenko, Z. A. (Inst. Problems Oncol., Kiev, USSR). *Dokl Akad Nauk SSSR* 271(3):703-704, 1974.

Changes in the DNA content and synthesis of blood-forming cells were investigated during the first 24 hr after injection of BALB/c mice with RNA isolated from the leukemic cells of rats with erythremic myelosis and BALB/c mice infected with Rauscher leukemia virus. High molecular weight cytoplasmic RNA was isolated by removing protein with phenol. Spectroscopic examination showed highly purified RNA preparations. Adsorption cytospectrophotometry was used to establish the DNA content of the cells, while autoradiography was employed to study DNA synthesis after injection of ^{3}H-thymidine. Increased DNA synthesis was observed toward the end of the first 24 hr. Labeled blast cells increased to 36 ± 2.48% in the experimental mice and to 22 ± 3.98 in the controls with the increase in the number of grains per labeled cell from 30 ± 4.76 to 40 ± 4.26. At the same time, DNA increased in the parental blood cells (13.8 pg in the experimental animals, 11.7 pg in the controls). These findings confirm the hypothesis that an early stimulation of cellular DNA synthesis is essential for malignant transformation.

5031 TARGET-CELL CHARACTERIZATION FOR RAUSCHER LEUKEMIA VIRUS *IN VITRO*.

(E.) Seidel, H.-J. (Ctr. Basic Clin. Res., U. Ulm, W. Germany). *Bibl Haematol* (39):935-942, 1973.

Two days after infection with Rauscher leukemia virus, CBA mice showed a significant drop in the numbers of colony-forming units (CFU) in spleen and bone marrow. These changes, together with previously observed changes in three hemopoietic cell lines (erthropoiesis, thrombopoiesis, and granulopoiesis) of infected CBA mice, led to the hypothesis that the hemopoietic stem cell is the target of the Rauscher virus. This was confirmed by the detection of CFU/tumor colony forming units (TCFU) in the spleen of mice five days after infection under different conditions. The TCFUs could be demonstrated even in polycythemic mice which do not develop spleen tumors. Bleeding or endotoxin injection before virus infection increased the number of CFUs or TCFUs in BALB/c and CBA mice. Both pretreatments led to an expansion of the stem cell pool in the spleen of normal mice. When the stem cell pool was decreased by radiation (150 r), the onset of Rauscher disease and the development of TCFUs were delayed. Myleran (60 mg/kg)-treated mice, which possessed no transplantable stem cells, did not develop TCFUs in the spleen or bone marrow. These findings are evidence that stem cells are target cells for the Rauscher virus.

5032 ACTIVITY OF DNA-DEPENDENT RNA POLYMERASE FROM THE SPLEEN OF MICE INFECTED WITH RAUSCHER LEUKEMIA VIRUS.

(Rus.) Pravdina, N. F. (D. I. Ivanovskii Inst. Virol., Moscow, USSR), V. M. Shobukhov, V. I. Nikishina, T. V. Veselovskaia and G. A. Galegov. *Biokhimia* 39(5):952-955, 1974.

BALB/c mice were injected with 0.25 ml virus suspension from spleens of mice injected with Rauscher leukemia virus (RLV). Each dose-group consisted of 10-20 animals. DNA-dependent RNA polymerase activity was determined by the incorporation of ^{3}H-GTP in the acid-insoluble nuclear fraction in the presence of ATP, UTP, CTP and Mn^{2+}. The results show that in the spleen nuclei of RLV mice, DNA-dependent RNA polymerase activity increased 3-6 times. The highest enzyme activity was observed 8-9 days after the infection. A correlation was found between spleen weight and enzyme activity. Mixtures of enzymes from infected and uninfected spleens did not show addition of activity. This was interpreted to suggest that the normal spleen has an inhibitor suppressing DNA-dependent RNA polymerase, while in the infected spleen the synthesis of the inhibitor is either discontinued or the inhibitory activity decreases.

5033 COMPARATIVE BIOCHEMICAL PROPERTIES OF RNA-DIRECTED DNA POLYMERASES FROM RAUSCHER MURINE LEUKEMIA VIRUS AND AVIAN MYELOBLASTOSIS VIRUS.

(E.) Waters, L. C. (Carcinog. Program, Oak Ridge Natl. Lab., Tenn.) and W. K. Yang. *Cancer Res* 34(10):2585-2593, 1974.

The RNA-directed DNA polymerases from Rauscher murine leukemia virus (RLV) and avian myeloblastosis virus (AMV) were compared, with emphasis on the biochemical properties important for an effective polymerase assay. The effects of divalent cations, pH, and temperature on the ability of the two polymerases to utilize various template primers were significantly different. The template primers tested included DNase-activated calf thymus DNA, $d(A\text{-}T)_n$, $(rA)_n \cdot (rU)_n$, $(rA)_n \cdot (dT)_n$, $(rA)_n \cdot (dT)_6$, $(dA)_n \cdot (dT)_6$, $(rC)_n \cdot (dG)_6$, and $(rI)_n \cdot (dC)_6$. All showed individual characteristic requirements for divalent cations, pH, and temperature for optimum activity with the two polymerases. A minor change in the optimal conditions usually resulted in a marked decrease in the detected polymerase activity. In kinetic experiments, the initial incorporation of deoxythymidine 5'-monophosphate appeared to be the rate-limiting step in the $(rA)_n \cdot (rU)_n$-dependent activity of the murine virus polymerase, whereas this was less apparent with the avian virus polymerase. The $d(A\text{-}T)_n$-dependent activity of both purified virus polymerases was competitively inhibited by $(rU)_n$ or $(rG)_n$.

5034 HEMOPOIETIC CHANGES IN RAUSCHER VIRUS-RESISTANT MICE WHEN VIRAL EXPOSURE IS ASSOCIATED WITH L-FORM MICROORGANISMS ISOLATED FROM PATIENTS WITH ACUTE LEUKEMIA.

(Rus.) Martynova, V. A. (Inst. Hematol. Blood Transfus., Moscow, USSR), E. M. Kipervasser, A. G. Vlasova, F. M. Guseinova. *Vopr Onkol* 20(10):88-89, 1974.

L-form bacteria isolated from the blood and bone marrow of patients with acute leukemia were injected in combination with Rauscher virus into 92 C57Bl mice 2-3 months old. During the first 2 months of the experiment, erythroid cells decreased to 6% (31.9% in the controls), reticular cells increased to 5.7% (1.4% in the controls) and immature WBC increased to an average of 75.1% (58.1% in the controls). The increase in WBC was accompanied by impaired maturation of myeloblasts and promyelocytes. In five mice the bone marrow contained almost nothing but undifferentiated cells; this was accompanied by anemia, leukocytosis (17,000-42,000/mm^3) and an outpouring of myelocytes and myeloblasts into the peripheral blood. Histological studies revealed focal proliferation of immature cells in 14 mice; ten mice had hyperplasia of myeloid cells in the bone marrow; and three mice had leukemia with a massive proliferation of cells in the spleen, liver, bone marrow and lungs. The results indicate that L-form bacteria from leukemic patients are pathogenic and adversely affect hematopoiesis in mice.

5035 UNINTEGRATED MURINE LEUKEMIA VIRAL DNA IN NEWLY INFECTED CELLS. *(E.)* Lovinger, G. G. (Flow Lab., Inc., Rockville, Md.), H. P. Ling, R. A. Klein, R. V. Gilden and M. Hatanaka. *Virology* 62(1):280-283, 1974.

Intracellular unintegrated viral DNA sequences were demonstrated by DNA-DNA hybridization in BALB/c mouse embryo fibroblasts within the first four hr after infection with Rauscher leukemia virus. Control studies indicated that this DNA most probably represents newly synthesized rather than pre-infection host viral sequences. The DNA was found primarily in two size categories. Using wild-type lambda bacteriophage DNA fragments as markers, the molecular weight of the larger size DNA was estimated to be 2.25-3.25 x 10^6. The smaller-size DNA sedimented slightly faster than the *in vitro* DNA product of the endogenous RNA-dependent polymerase reaction. Further investigations are in progress to determine whether these DNA species are intermediates in the integration of viral DNA into the host genome. It is concluded that these results provide support for the provirus hypothesis.

036 SELECTIVE INHIBITION BY KANAMYCIN OF FOCUS FORMATION BY ROUS AND MOLONEY SARCOMA VI-USES. *(E.)* Murphy, W. H. (Dep. Microbiol., Univ. ichigan, Ann Arbor), J. Maisel, C. Bullis and A. J. aras. *J Natl Cancer Inst* 52(5):1463-1468, 1974.

n cultures of chick or mouse embryo fibroblasts, anamycin at a concentration of 500 μg/ml inhibited ocus formation by the Bryan and Schmidt-Ruppin trains of Rous sarcoma virus (RSV) about 90 and 70% espectively. At a dose of 400 μg/ml it suppressed ocus formation by Moloney sarcoma virus (MSV) about 5%. Aminodeoxykanamycin (ADK) at 100-200 μg/ml com-letely prevented the appearance of RSV foci and de-reased MSV foci 50-75%. The drug was not toxic to ells or directly virucidal. It only slightly re-ressed virus attachment, penetration, eclipse, and eplication. At concentrations that prevented focus ormation, ADK did not inhibit RSV RNA-directed DNA olymerase. Tumor formation *in vivo* by MSV or RSV as not altered significantly by kanamycin or ADK. at ADK selectively inhibited focus formation with-t depressing virus replication or virion RNA-di-ected DNA polymerase indicates its selective action the gene functions required for cell transfor-tion.

37 THE GROWTH OF MAMMALIAN EMBRYONIC CELLS TRANSFORMED BY ROUS VIRUS. *(Rus.)* Obukh, D. (N. F. Gamaleia Inst. Exp. Epidemiol. Microbiol., scow, USSR) and I. N. Kriukova. *Vopr Onkol* 20(11): -48, 1974.

owth was studied in primary embryonic tissue cul-res of Wistar rats, golden hamsters and Af, CC57Bl/6, d BALB/c mice infected with the Carr-Silber and akova-5 strains of Rous sarcoma virus (RSV). Mur-e embryonic cultures infected with RSV began to dergo transformation 2-3 wk after infection. Three-mensional growth foci were observed which were made of small round and thin spindle-shaped cells; round cells predominated. Within 2 wk after appearance of transformed foci, the vacuolization of cells began. Cells also sloughed off parallel to the increase in the number of transformed foci in all 30 cultures of murine embryonic tissue, regardless of whether they were infected with the Carr-Silber or Diakova-5 strain of RSV. When passaged, most of the cells did not adhere to the glass and those that did had vacuolized cytoplasm and were almost completely unable to grow for two to three wk. The transformed rat and hamster cells, on the other hand, were readily passaged and cell vacuolization after transformation was less pronounced. It is suggested that, unlike hamster and rat cells, murine cells are more sensitive to the culture conditions after transformation. This may be a characteristic feature of cells transformed by RNA-containing viruses. These cells are noted for their poor survival *in vitro*.

5038 STUDIES IN GENETIC RESISTANCE TO RSV(RAV-O): A THIRD TYPE OF GENETIC RESISTANCE TYPIFIED BY THE W LINE OF FOWL AND FURTHER SUPPORT FOR THE TWO LOCI GENETIC MODEL. *(E.)* Pani, P. K. (Houghton Poul. Res. Stn., England). *J Gen Virol* 23(1):33-40, 1974.

Embryos of the highly inbred Reaseheath Cuckoo Leghorn W line were found to be resistant to RSV(RAV-O), a subgroup E virus produced in cells transformed by the Bryan high-titer strain of Rous sarcoma virus in the presence of endogenous leukosis virus such as RAV-O. The results of test-cross matings between this line and the inbred I and C lines confirmed the two-loci genetic model previously reported for inheritance of response of fowl to RSV(RAV-O). Two loci were postulated in this model: inhibitor^e, with resistance I^e allele dominant over i^e, and tumor virus e (*tve*), with susceptibility allele e^s dominant over resistance allele e^r. I^e is epistatic to e^s, inhibiting its expression. The genotype of the W line was typified as $I^eI^ee^re^r$, a third type of resistance; the genotypes of the I and C lines are $I^eI^ee^se^s$ and $i^ei^ee^re^r$, resp. In certain crosses, embryos resistant to a subgroup B virus were also resistant to RSV(RAV-O), but embryos susceptible to subgroup B viruses were found segregating for resistance to subgroup E virus. This type of segregation does not support the concept that the association between the two types of resistance is dependent on genes at the *tvb* locus.

5039 ENHANCEMENT OF SIMIAN VIRUS 40 INFECTION IN SIMIAN AND HUMAN CELLS BY PERMISSIVE CELL EXTRACTS (38238). *(E.)* Righthand, V. F. (Wayne State Univ. Sch. Med., Detroit, Mich.). *Proc Soc Exp Biol Med* 146(4):1014-1020, 1974.

A transferable, subcellular component of uninfected simian cells that enhances SV40 titers in less susceptible simian and human cell cultures and increases frequency of SV40-induced transformation in a line of human diploid fibroblasts is described. This enhancer was detected by procedures previously used for isolation and characterization of another enhancer for an enterovirus. Enhancement was demonstrated by 10 to 40-fold higher plating efficiency in simian cells, 10 to 30-fold increase in virus production by human cells, and three-fold increase in frequency of transformation in a line of human diploid fibroblasts after inoculation of mixtures containing CV-1 African green monkey kidney cell extracts and virus. The enhancer was recovered from culture cells by a mild extraction procedure and was sedimented by centrifugation at 20,000g for one hr. The active component of the supernatant appeared to be protein. The enhancer was not dialysable and was stable for three hr at 23 C and for two weeks at 5 C. A direct correlation between enhancer activity and protein concentration of dialyzed CV-1 extracts was observed. Incubation of virus with enhancer preparations for 20 min at 23 C resulted in the formation of a complex that was not dissociated by dilution. Although these properties of the SV40 enhancer are similar to those described previously for the enterovirus enhancer, the SV40 enhancer differs from the enterovirus enhancer in its host and viral specificity. These observations suggest that analogous enhancement systems may exist for other viruses.

5040 THE PROPERTIES AND ORIGIN OF THE PROTEINS IN THE SV40 NUCLEOPROTEIN COMPLEX.

(E.) Sen, A. (Dep. Biochem. Sci., Princeton Univ., N.J.), R. Hancock and A. J. Levine. *Virology* 61(1):11-21, 1974.

Infection of African green monkey kidney cells with simian virus 40 (SV40) has previously been shown to result in the formation of an SV40 specific DNA-protein complex which sediments at about 50S. This nucleoprotein complex was fixed with formaldehyde and the DNA:protein ratio was estimated from its buoyant density in CsCl equilibrium density gradients. Most of the complex (> 95%) had a buoyant density of 1.47 g/cc, while a minor fraction had a density of 1.67 g/cc. This corresponded to a protein:DNA ratio of 0.82-0.95 for the major species and 0.04-0.06 for the minor component. With regard to the effect of ionic strength, the conformational changes in complex can be detected below 0.6 M NaCl, while above this ionic strength the protein:DNA ratio decreases. One or two viral coat proteins, as determined by the SV40 temperature-sensitive mutants tsB8 and tsB11, were associated with the 50S nucleoprotein complex. These two coat proteins plus one internal histone-like protein (a tightly bound protein) may account for 35-50% of the total protein in the complex. Two other histone-like internal viral coat proteins also appear to be present in the complex and could be responsible for imparting the characteristic compactness.

5041 GANGLIOSIDE ACCUMULATION BY TRANSFORMED MURINE FIBROBLASTS (3T3) CELLS AND CANINE ERYTHROCYTES.

(E.) Keenan, T. W. (Dep. Anim. Sci., Purdue Univ., Lafayette, Ind.), W. W. Franke and H. Wiegandt. *Hoppe Seylers Z Physiol Chem* 355(12):1543-1548, 1974.

The binding of the gangliosides $G_{Gtet}1$ [Gal-GalNAc-(NeuNAc)-Gal-Glc-Cer], $G_{Gtet}2a$ [NeuNAc-Gal-GalNAc-(NeuNAc)-Gal-Glc-Cer], and $G_{Lac}1$ [NeuNAc-Gal-Glc-Cer] to simian virus 40 (SV40)-transformed murine 3T3 fibroblasts and to dog erythrocytes was studied. The uptake of G_{Gtet1} by the SV40-transformed 3T3 cells was rapid for the first 30 min, after which a plateau was reached which persisted for the next 60 min. The plateau was considered indicative of the binding of $G_{Gtet}1$ to or incorporation into the plasma membrane. The amount of $G_{Gtet}1$ bound during this time averaged 1.7 nM/mg protein; the ganglioside bound was not chemically altered and the ganglisides bound within 90 min were bound to the outside of the cell surface membrane. The accumulation of $G_{Gtet}1$ was concentration dependent, although the cells appeared to have a finite capacity for binding ganglioside. Binding of $G_{Gtet}1$ was markedly decreased when $G_{Gtet}2a$ was added to the incubation medium. Suspensions of dog erythrocytes rapidly accumulated $G_{Lac}1$, the final concentration being 10-fold higher than the level of ganglioside in control erythrocytes. However, while only about 15% of the ganglioside sialic acid of the control erythrocytes was released by neuraminidase, the artificially accumulated ganglioside was completely degraded by neuraminidase. The level of ganglioside sialic acid in the ganglioside-enriched, neuraminidase-treated erythrocytes was the same as in neuraminidase-treated controls. Erythrocytes incubated with $G_{Lac}1$ were much more stable than controls to subsequent washings and were more resistant to various cell lytic procedures such as freezing and thawing. This was also true of the neuraminidase treated erythrocytes, suggesting that the lactosylceramide products of the digestion remained in the membrane.

5042 SUBSTRATE-ATTACHED GLYCOPROTEINS MEDIATING ADHESION OF NORMAL AND VIRUS-TRANSFORMED MOUSE FIBROBLASTS.

(E.) Culp, L. A. (Sch. Med., Case Western Reserve U., Cleveland, Ohio). *J Cell Biol* 63:71-83, 1974.

When BALB/c 3T3, simian virus 40 (SV40)-transformed 3T3 (SVT2), and revertant variants of the transformed cells are removed by sodium edetate treatment from the substrate on which they are grown, they leave behind a glycoprotein layer of substrate-attached material (SAM). All three cell types displayed a 30% higher plating efficiency when grown on 3T3 SAM. SVT2 cells grown on 3T3 SAM were comparatively more spread out on the substrate, resisted crawling over neighboring cells, and resisted movement away form the edges of colonies; SVT2 SAM did not cause these changes. SVT2 cells attached to 3T3 SAM- or SVT2 SAM-coated cover slips with a faster initial rate and to a higher saturation level than to untreated substrate; 3T3 and revertant cells exhibited no preference. There was no species specificity in these phenomena. Trypsin-released cells attached much more slowly than sodium edetate-released cells. 3T3 SAM was not effective in lowering the saturation density of mass cultures of virus-transformed cells. The data suggest that the substrate-attached glycoproteins of normal cells affect the cellular adhesivity, morphology, movement, and perhaps growth patterns of virus-transformed cells, causing partial reversion of these properties of transformed cells to those found in contact-inhibited fibroblasts.

5043 SIMIAN VIRUS 40 T ANTIGEN BINDS TO DNA.

(E.) Carroll, R. B. (Imperial Cancer Res. Fund Lab., London, England), L. Hager and R. Dulbecco. *Proc Natl Acad Sci USA* 71(9):3754-3757, 1974.

he three molecular wt classes of simian virus 40 T
ntigen (300,000, 120,000, and 70,000) reported by
thers were observed with complement fixation when
uclear extracts from virus-transformed cells were
entrifuged through sucrose gradients. The two
igher molecular wt forms were converted to the
mallest (5S) form by high salt concentrations (0.5-
M KCl or NaCl), suggesting that they differ in the
egree of aggregation. All the forms of the antigen
ound efficiently to double-stranded DNA-cellulose
olumns at pH 6.2 and low salt, and eluted in two
ractions: one at pH 8.0 and low salt, the other at
H 8.0 and high salt. The antigen had little affi-
ity for single-stranded DNA. The double affinity
or double-stranded DNA suggests that the T antigen
as similarities to the λ repressor protein.

044 STUDIES ON THE MECHANISM OF ACTINOMYCIN D
RESISTANCE OF AN SV40-TRANSFORMED HAMSTER
ELL LINE. *(E.)* Cremisi, C. (Inst. Res. Sci. Cancer,
illejuif, France), G. E. Sonenshein and P. Tournier.
cp Cell Res 89(1):89-94, 1974.

e resistance of simian virus 40 (SV40)-transformed
mster cells (TSV5 C12A) to actinomycin D, puromy-
n, and proflavine, was investigated in comparison
an actinomycin-sensitive clone TSV5 C12. Growth
rves were determined in the presence or absence
2 μg/ml of actinomycin D and 2 or 5 μg/ml pro-
avine. Cultures were incubated with ^{3}H-actinomy-
n D, ^{3}H-uridine, or a mixture of ^{3}H-amino acids,
d the rates of uptake determined. The growth
rve of the sensitive strain was markedly inhibited,
ile that of the resistant strain was unaffected.
rmeability to ^{3}H-actinomycin was much greater in
e sensitive than in the resistant strains, and
creased as a function of time. DEAE dextran and
ly-L-ornithine had no effect on penetration in
e controls, while dextran caused a 2- to 10-fold
crease in the resistant cells, and ornithine
used a slight increase. Actinomycin D at a con-
ntration of 2 μg/ml did not affect incorporation
^{3}H-uridine into resistant cells, and RNA synthesis
s at 85-90% of its normal level. In sensitive
lls, RNA synthesis was almost completely inhibited.
romycin inhibited protein synthesis from ^{3}H-amino
ids in the sensitive cells but not the resistant.
sistant cells were also nonpermeable to proflavine.
is concluded that the resistance of TSV 5 C12A
lls to actinomycin D is due to alteration in the
ll membrane rather than to any internal mechanism.

45 FURTHER OBSERVATIONS ON A HUMAN SYNCYTIAL
VIRUS FROM A NASOPHARYNGEAL CARCINOMA.
.) Epstein, M. A. (U. Bristol Med. Sch., England),
G. Achong and G. Ball. *J Natl Cancer Inst* 53(3):
l-688, 1974.

unusual, apparently new, syncytium-inducing virus
s previously discovered in long-term lymphoblastoid
ltures from a human nasopharyngeal carcinoma (NPC).
isera to each of the morphologically similar known
imal syncytial viruses failed to neutralize this
rus, indicating that it is immunologically distinct.

The virus replicated in monolayer cultures of rat, mouse, and bovine embryo fibroblasts and caused the characteristic cytopathic effect in each. The immature viral particles measured 65 mμ in diameter and had a hexagonal profile and visible surface substructure. The mature particles were 90 mμ in diameter with spines 13 mμ long. Both the mature and immature particles were fragile and labile. When virus-infected fibroblasts were incubated with 5-bromo-2'-deoxyuridine, virus replication was prevented, indicating that the virus probably possesses reverse transcriptase. The virus required actively dividing cells for replication and yielded cell-free preparations with low infectivity. This virus appears to belong to a unique group of animal syncytial viruses which includes the bovine syncytial virus and feline syncytial virus. This group should be designated Echino viruses because of the long spines covering the mature particles.

5046 THE ESTABLISHMENT OF A LINE OF VISNA VIRUS-PRODUCING HUMAN ASTROCYTES (V-1181N1). *(E.)* Macintyre, E. H. (Natl. Jewish Hosp. Res. Ctr., Denver, Col.), C. J. Wintersgill and H. Thormar. *Med Res Eng* 11(4):7-13, 1974.

A cloned human tumor astrocyte line (1181N1) infected with visna virus has been investigated. The morphologic alterations caused by visna virus in the human cells (V-1181N1) are comparable with those produced in sheep cells *in vitro*, with one exception: sheep cells are killed by the virus, V-1181N1 cells are much more resistant. This is a true species-specific difference of response to the virus, because human-passaged visna virus does cause lysis of sheep cells. The V-1181N1 cells produce complete virus whose titer has been rising since the time of initial infection. Fifteen months after initial infection, the titer of the cell-free supernatant fluid from V-1181N1 cultures was between 10^4 and $10^{5.5}$ median tissue culture infective dose/0.1 ml. The V-1181N1 cells carry visna virus-specific cytoplasmic antigen. This cell line should provide a means of studying changes caused in astrocytes by a virus known to cause a demyelinating disease.

5047 PSEUDOTYPE FORMATION BETWEEN ENVELOPED RNA AND DNA VIRUSES. *(E.)* Huang, A. S. (Harvard Med. Sch., Boston, Mass.), E. L. Palma, N. Hewlett and B. Roizman. *Nature* 252(5485):743-744, 1974.

5048 PRELIMINARY STUDY OF *IN VITRO* REPLICATION OF TYPE 5 ADENOVIRUS IN LYMPHOCYTES FROM THE UMBILICAL CHORD. *(Fr.)* Perrinet, M. C. (Virol. Unit, INSERM, Lyon, France) Y. Chardonnet and R. Sohier. *Ann Microbiol [B] (Paris)* 125(4):575-580, 1974.

5049 PULMONARY ADENOMATOSIS IN SHEEP (JAAGSIEKTE): ULTRASTRUCTURAL STUDY. *(It.)* Bucciarelli, E. (Dep. Normal Human Anat., Univ. Urbino, Italy). *Lav Ist Anat Istol Patol Perugia* 33(2):99-117, 1973.

5050 PULMONARY ADENOMATOSIS IN SHEEP (JAAGSIEKTE). I. MORPHOLOGY OF CELL LINES 7z97 AND C584 CULTIVATED IN VITRO FOR LONG PERIODS. *(It.)* Ribacchi, R. (Univ. Med. Surg., L'Aquila, Italy). *Lav Ist Anat Istol Patol Perugia* 34(1):5-20, 1974.

5051 PROGRESSION OF RNA VIRUS-INDUCED TUMORS: SARCOMATOSIS WITH HEPATOSPLENOMEGALY IN A RAT REGRESSED FROM FELINE SARCOMA VIRUS INDUCED TUMOR. *(E.)* Maruyama, K. (U. Texas Houston, M. D. Anderson Hosp. Tumor Inst.), S. H. Wagner, M. E. Cox and L. Dmochowski. *Tex Rep Biol Med* 32(2):601-602, 1974.

5052 A LEUKEMIC LYMPHOPROLIFERATIVE DISEASE IN A/J MICE FOLLOWING INOCULATION WITH BLOOD FROM PATIENTS WITH ACUTE INFECTIOUS HEPATITIS. *(E.)* Yoeli, M. (New York Univ. Sch. Med., New York), R. A. Burningham and M. Habib. *Cancer Res* 34(12):3440-3445, 1974.

5053 CURRENT DIAGNOSTIC AND ETIOLOGICAL PROBLEMS IN PRIMARY HEPATIC NEOPLASMS. *(It.)* Migneco, G. (Inst. Clin. Gen. Med. Med. Ther., Univ. Palermo, Italy), A. Didato and S. Tripi. *Boll Ist Sieroter Milan* 53(1):79-87, 1974.

5054 CHARACTERIZATION OF HERPES SIMPLEX VIRUS ISOLATED FROM A LIP TUMOR WHICH DEVELOPED AT A SITE OF RECURRENT HERPES. *(It.)* Cassai, E. N. (Inst. Microbiol., Univ. Ferrara, Italy) M. Terni and A. Califano. *Tumori* 60(4):325-336, 1974.

5055 REASONS FOR THE DEVELOPMENT OF CHROMOSOME ABERRATIONS IN HUMAN EMBRYONIC FIBROBLAST CELL CULTURES INFECTED WITH HERPES SIMPLEX VIRUS. *(Rus.)* Sablina, O. V. (Inst. Cytol. Genetics, Novosibirsk, USSR). *Genetika* 10(7):131-138, 1974.

5056 THE INCREASING SUSCEPTIBILITY OF HEMATOPOIETIC STEM-CELLS TO FRIEND LEUKEMIA VIRUS AFTER X-IRRADIATION. *(E.)* Hirashima, K. (Natl. Inst. Radiol. Sci., Chiba, Japan) and T. Kumatori. *Radiat Res* 59(1):91, 1974.

5057 THE NUMBER OF *IN VITRO* STEM CELLS IN AKR LEUKEMIC MICE. *(E.)* Chevalier, C. (Gustave-Rouusy Inst., Villejuif, France), N. Gaillard and E. Frindel. *Blood* 44(5):743-750, 1974.

5058 CORRELATION BETWEEN THE PRODUCTION OF MATURE VIRUS PARTICLES AND THE HISTOMORPHOLOGICAL DIFFERENTIATION OF VIRUS-INDUCED MAMMARY CARCINOMA IN MICE. *(Ger.)* Zotter, S. (Carl Gustav Carus Med. Acad., Dresden, E. Germany) M. Muller and C. Kemmer. *Arch Geschwulstforsch* 44(3):212-221, 1974.

5059 TRANSPLANTABLE ASCITES TUMOR FROM A MOUSE WITH A MOLONEY SARCOMA: PROPERTIES OF THE TUMOR, ANTIGEN AND VIRUS. *(Ger.)* Weiland, E. (Fed. Res. Inst. Virus Dis. Animals, Tubingen, W. Germany) and F. Weiland. *Z Immunitaetsforsch* 148(2):151-161, 1974.

5060 THE ACTIVITY OF DISTAMYCIN AND ITS ANALOGUES ON MOLONEY MURINE SARCOMA VIRUS *IN VITRO* AND *IN VIVO*. *(It.)* Di Marco, A. (Natl. Inst. Tumor Res. Treatment, Milan, Italy), A. M. Casazza, F. Giuliani and C. Soranzo. *Boll Chim Farm* 113(2):106-109, 1974.

5061 MURINE SARCOMA VIRUS AND CYCLIC ADENOSINE MONOPHOSPHATE. *(It.)* Turano, A. (Munic Hosp., Brescia, Italy). *Ig Mod* 67(2):175-183, 1974.

5062 INHIBITION OF MURINE-SARCOMA DEVELOPMENT BY DEOXYCORTICOSTERONE ACETATE. *(E.)* Seifter, E. (Albert Einstein Coll. Med., Bronx, N.Y.), G. Rettura, A. A. Demetriou, S. Levenson, S. Rahman and J. Seifter. *J Natl Cancer Inst* 53(6):1809-1812, 1974.

5063 STRUCTURAL STUDY OF H-TYPE PARTICLES WHICH ARE FREQUENTLY ASSOCIATED WITH HAMSTER CELLS. *(Fr.)* de Micco-Pagis, C. (Res. Univ. 119, INSERM, Marseille, France), P. de Micco and G. Meyer. *Ann Microbiol* [*B*] *(Paris)* 125(1):99-105, 1974.

5064 THE *IN VIVO* ROLE OF DIFFERENTIATING HORMONES IN VIRUS-INDUCED MURINE HEMATOPOIETIC DISEASE. *(E.)* Fredrickson, T. N. (No affiliation), J. LoBue, B. Morse, W. Hardy, A. Weitz-Hamburger, P. Ferdinand and J. Camiscoli. *Exp Hematol* 1(5):257, 1974.

5065 PAPILLOMATOSIS INDUCED-IN MAN BY BOVINE PAPILOMA VIRUS. *(Bul.)* Vardapetian, Sh. S. (Armenian Res. Inst. Animal Husbandry Veterinary Sci., USSR). *Onkologiia (Sofiia)* 10(2):54-57, 1973.

5066 MALIGNANT GRANULOMA IN ANIMALS DURING EXPERIMENTAL INOCULATION WITH REO 1 VIRUS. *(Pol.)* Markowa, J. (Acad. Med., Krakow, Poland), D. Zarzycki and A. Liszka. *Przegl Lek* 31(9):788-792, 1974.

5067 CIRCULATING INTERFERON IN CHICKENS INOCULATED WITH ROUS VIRUS: EFFECTS OF CORTICOSTEROIDS. *(Sp.)* Ayerra de Holstein, B. (Carlos Malbran Nat. Inst. Microbiol., Buenos Aires, Argentina) E. Sacerdote de Lustig and A. R. Teyssie. *Medicina (B Aires)* 34(3):219-222, 1974.

5068 NEOPLASTIC TRANSFORMATION *IN VIVO* AND *IN VITRO* OF REGENERATING HAMSTER HEPATIC CELLS BY ONCOGENIC DNA SIMIAN VIRUS 40. *(E.)* Diamandopoulos, G. T. (Harvard Med. Sch., Boston, Mass.). *Am J Pathol* 74(2):42a-43a, 1974.

069 OUABAIN-SENSITIVE ^{86}Rb UPTAKE AND ATPase ACTIVITY OF MOUSE 3T3 AND SV40 TRANSFORMED T3 FIBROBLASTS. *(E.)* Kimelberg, H. K. (Roswell ark Mem. Inst., Buffalo, N.Y.) and E. Mayhew. *Fed roc [III]* 33(5):1415, 1974.

070 EFFECT OF BRADYKININ INJECTION INTO SYNGENIC SV-40 HAMSTER TUMORS ON RATE OF TUMOR GROWTH ND SPLENIC HISTIDINE DECARBOXYLASE ACTIVITY. *(E.)* ppelmann, L. E. (Univ. California Los Angeles Sch. ed.), T. C. Moore, C. A. E. Lemmi and D. D. Porter. *Int Res Commun* 2(4):1272, 1974.

See also:

* (Rev): 4812, 4813, 4814, 4815, 4816, 4817, 4834, 4836, 4837, 4838, 4839, 4840, 4841, 4850, 4857, 4859, 4860
* (Chem): 4890, 4919, 4925
* (Immun): 5080, 5084, 5085, 5090, 5092, 5093, 5094, 5095, 5096, 5097, 5106, 5107, 5113, 5114, 5115, 5116, 5118, 5138, 5145, 5173, 5175, 5179, 5180, 5181
* (Epid): 5300

5071 CORRELATION OF IMMUNE REACTIVITY AND CLINICAL STATUS IN CANCER. *(E.)* Chretien, P. B. (Natl. Cancer Inst., Bethesda, Md.), W. J. Catalona, P. L. Twomey and W. F. Sample. *Ann Clin Lab Sci* 4(5):331-338, 1974.

Cellular immune competence was quantified in 100 postoperative cancer patients considered clinically free of tumor and the results compared with those from 200 preoperative cancer patients and over 400 normal persons. Immunity was assessed in terms of *in vitro* phytohemagglutinin (PHA)-induced lymphocyte reactivity and *in vivo* dinitrochlorobenzene (DNCB) contact sensitivity. The immune reactivity of the cured cancer patients correlated with the histology of the tumor which had been excised. Patients cured of squamous carcinomas had high incidences of impaired lymphocyte reactivity and DNCB contact sensitivity similar to that found in preoperative patients. Patients with sarcomas, melanomas, and adenocarcinomas, however, showed greater lymphocyte reactivity than their preoperative counterparts and normal subjects and did not display the abnormalities of DNCB contact sensitivity present in the comparable preoperative groups. A suppressive effect on lymphocyte reactivity was seen with sera from preoperative patients with squamous carcinomas and sarcomas and with sera from cured squamous carcinoma patients. The persisting high incidence of impaired cellular immunity in patients cured of squamous carcinomas indicates the need for investigation into genetic and environmental factors which may be responsible for the defects and determination of their relationship to tumor induction. The intact cellular immune competence of patients clinically curred of sarcomas, melanomas, and adenocarcinomas indicates that patients treated for tumors of these histologic types who display abnormalities by the assays used may be suspected of having residual tumor.

5072 LYMPHOCYTE FUNCTION AND HL-A ANTIGEN FREQUENCY IN GYNECOLOGIC SQUAMOUS CANCER: A PRELIMINARY REPORT. *(E.)* Twomey, P. L. (Natl. Inst. Health, Bethesda, Md.), G. N. Rogentine and P. B. Chretien. *Int Surg* 59(9):468-472, 1974.

Cellular immune competence in 51 patients with gynecologic neoplasms was measured by quantitating lymphocyte response to phytohemagglutinin. The 51 patients included 31 with squamous cell carcinoma of the cervix, 8 with squamous cell carcinoma of the vulva or lower vagina, and 12 with adenocarcinoma of the uterus. Genetic make-up in 43 cancer patients was characterized by determining human lymphocyte antigen (HL-A) types. Thirty-eight of the 39 patients with squamous cell cancers had low lymphocyte reactivity (38%), whereas no abnormality was found in patients with adenocarcinoma of the same organ. The response in squamous cancer patients differed significantly from that of controls ($p<0.01$) and that of the adenocarcinoma patients ($p< 0.025$). Among squamous carcinoma patients, the frequency of HL-A8 was nearly 2 1/2 times higher than in control. This antigen has previously been linked to benign diseases with altered immune fraction and to trophoblastic malignancy. Abnormal HL-A antigen frequencies and immune defects in women with gynecologic squamous cell cancers may be important clues to the causes of these cancers and guides to therapy.

5073 REGULATION OF CONCOMITANT IMMUNITY: ACTIVATION OF SUPPRESSOR CELLS BY TUMOR EXCISION. *(E.)* Gershon, R. K. (Yale Univ. Sch. Med., New Haven, Conn.). *Isr J Med Sci* 10(8):1012-1023, 1974.

The relationship of unusual hamster lymphoma growth to the host's immune response was discussed. Reasons for host rejection of circulating tumor cells or secondary tumor transplants, but not the primary neoplasm, were also given. This tumor elicits high levels of concomitant immunity when transplanting venous blood from tumor-bearing hamsters into normal animals. Inhibition of metastatic spread is thus achieved. This may be reversed if the tumor is resected early after transplantation. Reinoculation of specific tumor cells after excision prevents metastatic dissemination, promotes activation of specific suppressor cells in lymphoid tissues and results in the loss of immunity. Resection, performed later during the immune response, does not abrogate immunity nor does it cause metastatic spread. Other factors regulating tumor immune response such as the interaction between splenic and nodal subpopulations of T cells, macrophage activation in rejection and the implications of draining lymph nodes are emphasized. Tumor resection, with a few exceptions, is considered beneficial to the immune response and thereby to the host.

5074 IMMUNITY AND MAREK'S DISEASE. *(E.)* Calnek, B. W. (New York State Vet. Coll., Cornell Univ., Ithaca). *Bibl Haematol* (39):389-394, 1973.

In order to characterize the effect of passive antibody in Marek's disease (MD), SCWL chickens, lymphoid leukosis virus-free, were divided into dams of antibody, MD virus (MDV) free (flock A), and those having a prior natural MDV infection (flock B) carrying precipitin and neutralizing antibody. Exposure of 36 flock A and 35 flock B chicks to MDV-infected chickens for ten weeks showed the incidence of MD (measured by death and gross lesions) to be 25% for flock A and 14% for flock B. Three groups of 1-2 day old chicks (flock A, flock B, and flock A treated with 1 ml of antiserum before, concurrently, and seven days after MDV inoculation) were examined for 7-18 days for clinical signs, gross and microscopic lesions, fluorescent antigen in frozen tissue, and infectivity of spleen cells. All features were seen in each group, with the frequency and intensity notably less in antibody positive chicks. The results support the theory that MD resistance is mediated through an immunological response.

5075 THE ROLE OF IMMUNITY IN RADIATION LEUKEMOGENESIS. *(E.)* Haran-Ghera, N. (Weizmann Inst. Sci., Rehovoth, Israel). *Bibl Haematol* (39):671-676, 1973.

To test the hypothesis that the lowered susceptibility of older mice to radiation leukemogenesis is re-ated to thymus involution or to lack of target cells n the thymus, C57BL/6 mice one-, five-, and eight-onths old were thymectomized and, two weeks later, rafted with newborn isologous thymus under the kidey capsule. Twenty days thereafter, the mice were xposed to fractionated whole body irradiation. Alhough the age of the grafted thymus was the same n the mice of different ages, the variation in inidence of leukemia with age (70%, one-month; 45%, ive-month; 21%, eight-month) was similar to that of ontrol intact animals of different ages (80%, one-onth; 60%, five-month; 35%, eight-month). Thereore, the decrease with age of susceptibility to adiation leukemogenesis is not dependent on thymus rchitecture. To test a different hypothesis, amely, that since radiation leukemia virus is preent during postnatal life in nonirradiated C57BL ice and its titer increases with age of the mice, he reduction with age of susceptibility to radiation eukemogenesis may be attributed to natural immuniation in older mice, experiments were next carried ut on humoral neutralizing antibody levels and ransplantation resistance of mice at different ges. It was found that antibody levels and translantation resistance increased with age. Further, he transplantation resistance was tumor-specific nd virus-inoculated normal and irradiated mice howed enhanced transplantation resistance compared o that shown by uninoculated controls. Thus, he findings were consistent with the second hypoesis.

76 GROWTH CHARACTERISTICS AND IMMUNOLOGICAL PROPERTIES OF A MYELOBLASTIC AND A LYMPHOLASTIC LEUKAEMIA IN PURE LINE RATS. *(E.)* Wrathmell, (Chester Beatty Res. Inst., Sutton, England) and Alexander. *Bibl Haematol* (39):649-653, 1973.

study was performed of the biological and immunologcal properties of two transplantable strain-specific eukemias, an acute myeloblastic leukemia (SAL) in the gust rat and an acute lymphoblastic leukemia (HRL) in he hooded rat. Both SAL and HRL cells disseminate wide, with HRL killing 4-5 times slower than SAL at the me dosage. Animals killed by SAL showed very few L cells at death; conversely, animals with HRL owed large numbers of HRL cells at death. SAL aths were from bone marrow failure, while HRL aths resulted from complete overwhelming of the imal by HRL cells. Organ invasion patterns difred with lymphoid tissues involved prior to bone rrow in HRL and HRL cells being found early in the ymus eventually causing its enlargement. SAL cells re not found in the thoracic duct and only appeared the lymph in the terminal stages. SAL inability pass from blood to lymph further characterized s myeloblastic nature, while HRL cell disseminaon was consistent with lymphoblastic leukemia. ansportation-type tumor-specific antigen (TTSA) sting, using syngeneic rats immunized with irdiated tumor cells, proved negative for SAL and L cells. TTSA testing by immunoblast counts from e thoracic duct proved negative for syngeneic rats, t positive for allogeneic rats receiving irradied SAL cells. Allogeneic thoracic duct cells imnized with syngeneic spleen cells showed no efct on SAL growth. The data suggest that SAL cells have a TTSA, and that in the allogeneic host immunoblasts directed against the TTSA are formed.

5077 STUDIES ON SPECIFICITY OF CELL-MEDIATED IMMUNITY TO HUMAN TUMORS. *(E.)* Takasugi, M. (Sch. Med., Univ. California, Los Angeles), M. R. Mickey and P. I. Terasaki. *J Natl Cancer Inst* 53(6): 1527-1538, 1974.

Peripheral lymphocytes from patients with various cancers were tested for their cytotoxic activity against 45 target culture cells from human tumors (breast, melanoma, laryngeal, colon, cervical, gastric, lung, bladder, prostatic and sarcoma). With a microassay in which the remaining target cells were counted electronically, 9294 combinations were tested. In general, the specificity of the cell-mediated cytotoxic reactions against the cultured tumor cells was not associated with the histologic type of the tumor. Specificity for the type of cancer was suggested for only one target culture (from a bladder tumor); no specificity was observed for a second bladder cancer target. Comparisons of tests performed on the same plate supported the conclusion that the specificity of the cell-mediated reduction of cultured tumor cells is not related to the "histologic" type of cancer.

5078 SPECIFICITY OF CELL-MEDIATED TRANSPLANTATION REACTIONS. I. STUDIES WITH THE TECHNIQUE OF INHIBITION OF MIGRATION AND AN ASSAY OF TUMOR IMMUNITY *IN VIVO*. *(E.)* Lake, P. (Dep. Immunol., Univ. Manitoba, Winnipeg, Canada), E. Sabbadini and A. H. Sehon. *Immunology* 27(3):427-439, 1974.

Two *in vitro* assays and one tumor transplantation *in vivo* assay were used to evaluate cell-mediated transplantation reactions using inbred DBA/2J, C3H/HeJ, A/J, C57Bl/6J and congenic C57Bl/10, B10.D2 (new), B10.A, B10.BR and B10.M mice. In the first *in vitro* assay, thymus cells (the antigen moiety) from one mouse strain were mixed with peritoneal macrophages from another strain bearing skin grafts from a third strain. In the second *in vitro* assay, lymph node cells taken from an area draining a skin graft were mixed with the antigens from peritoneal macrophages from another strain of mouse. In the first assay system, inhibition of migration occurred when the antigenic thymus cells were from a graft donor, or shared H-2 antigens with the graft donor. These inhibitory effects of migration were abolished in the presence of anti-θ sera. Transplantation of sarcoma tumor SaI from A/J mice into C57/B1110 or B10.D2 strains, which share the H-2 antigen series, was successful. Resistance to tumor take of SaI in those hosts grafted with skin from a variety of mouse strains was noted most strongly where SaI cells share the H-2 antigens of the graft donors. It is suggested that the two migration assays are similar in mechanism.

5079 CELL-MEDIATED IMMUNE RESPONSES OF PRELEUKEMIC AKR MICE. *(E.)* Martig, R. J. (Sch. Life Sci., Univ. Nebraska, Lincoln) and J. L. Tribble. *Infect Immun* 10(5):1018-1022, 1974.

Evidence was presented that preleukemic AKR mice have a well-developed immune system because of the following facts: (1) spleen cells from mice 1-10 months old gave a graft versus host reaction when injected into hybrid 8 day-old C57B116 cross AKR mice, as assessed by splenomegaly, (2) in a one way mixed lymphocyte reaction, preleukemic spleen cells were mixed 1:1 with the same cell type that had been attenuated with mitomycin C, cultured for five days, and exposed to ^{3}H-thymidine. In preleukemic spleen cells removed from animals three months old or older, there was a positive reaction (stimulation of ^{3}H-thymidine incorporation into DNA) indicating a well-developed immune response by this age, (3) when picryl chloride was painted onto a shaved area of the mice and six days later, a further dose of picryl chloride was painted onto the ear, a positive reaction (swelling that was maximal after 24 hr) resulted. Positive reaction was shown in this test by preleukemic mice one month old or older. These results suggest that the preleukemic condition is not associated with a depressed immune response in AKR hosts.

5080 DECREASE OF CYTOTOXIC IMMUNE LYMPHOID CELLS FOLLOWING REGRESSION OF VIRUS-INDUCED SARCOMAS IN MICE. *(E.)* Levy, J. P. (Hosp. St. Louis, Paris, France), J. C. Lecerc, E. Gomard, J. Pavie and F. Kourilsky. *Bibl Haematol* (39):689-697, 1973.

The kinetics of the antitumor cell-mediated immune cytotoxic reaction was studied in BALB/c mice after a single injection of murine sarcoma virus (MSV). Mice injected when 10-12 days old became progressors; those injected when 25-30 days old became regressors. Levels of cytotoxic lymphoid cells (CLC) were determined with the *in vitro* chromium release test. The target cells used in the test were YC8 leukemia cells, cross-reactive with MSV-induced sarcoma cells. CLC were detected during tumor growth but not following tumor rejection. The level of CLC in regressor mice paralleled mainly the development of the tumor and not the level of immune protection. Similar phenomena were observed in some leukemic systems. The apparent discrepancy of these results with those reported with colony inhibition tests in which a disappearance of CLC after rejection of tumor is not seen is suggested to be due, possibly, to the lower sensitivity of the chromium release test or to involvement of different populations of cells in the 2 tests. However, the observation that CLC are at a maximum at the time when the blocking activity of the serum has been reported to be also at maximum is difficult to explain in terms of simple blocking of tumor cells by circulating factors.

5081 THE STUDIES OF CELLULAR IMMUNITY TO GYNECOLOGIC TUMORS WITH MACROPHAGE MIGRATION INHIBITION TEST. *(E.)* Kenjo, T. (Sch. Med., Keio Univ., Tokyo, Japan). *Keio J Med* 23(1):1-15, 1974.

Cell mediated immunity was investigated *in vitro* using the macrophage migration inhibition test on 73 patients with operable gynecologic tumor and on ten mice bearing uterine tumor induced by 20-methylcholanthrene. Of 29 patients with malignant tumor (choriocarcinoma, ovarian cancer, carcinoma of the uterine cervix and corpus) 86% exhibited positive migration inhibitory activity immediately after extirpation of the tumor; all of the cases with benign tumor exhibited negative reactions. Out of 16 positive patients who were followed, 12 cases experienced complete loss of lesions and gave negative reactions 35 to 60 days after the initial test. The reactions of four patients with wide spread metastasis remained positive for more than three months after surgery. The migration inhibitory activity was detected in only 1/5 cases with invasive mole and in 11/33 patients with hydatidiform mole. The macrophage migration inhibition test was positive in 90% of the mice bearing uterine tumors and cross reaction was observed in some cases. These results suggest that host response to malignant tumor may be mediated by the cellular immune mechanism and only the malignant tumor may have antigenicity in this mechanism. This research provides convincing evidence for the existence of tumor specific antigens and a corresponding cellular immune response for a variety of human malignant tumors.

5082 IMPAIRED IMMUNE SURVEILLANCE IN DIFFERENT TYPES OF HUMAN NEOPLASM. *(E.)* Barboni, R. (Univ. Chieti Hosp. M. Malpighi, Bologna, Italy), C. Rovinetti and G. Moggian. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:253-256, 1974.

An *in vitro* study of lymphocyte reactivity to phytohemagglutinin (PHA) was conducted in 50 patients (all over 50 yr of age). Malignant tumors were either uterine, ovarian, bladder, prostate or kidney. Samples were cultured in TC 199 (0.5 x 10^6 cell/ml average) with 25 µl of PHA M. The 10% serum, normally added to the stock, was replaced with plasma from the test patients. Serum determinations of IgG, IgA, IgM and α_2-macroglobulin were made using radial immunodiffusion. The average blastic index of transformation for normal patients was 47% (range 34-60%) while an average of 22% (range 10-37%) was found for the cancer patients. The immunoglobulin and α_2-macroglobulin studies revealed no significant changes. No difference due to sex or to different primary tumor location was seen. The results imply that the depression of PHA response may reflect an immunological blocking which the author suggests may be due to the presence of enhancing antibodies in the plasma.

5083 INFLUENCE OF IMMUNE SUPPRESSION ON THE INDUCTION OF NEOPLASMS BY MLV AND MSV. *(E.)* Law, L. W. (Natl. Cancer Inst., Bethesda, Md.). *Bibl Haematol* (39):662-670, 1973.

The relationship between immunologic reactivity and induction of lymphocytic neoplasms in 12-week-old BALB/c mice infected with Moloney leukemia virus (MLV) was explored, using rabbit anti BALB/c thymocyte antiserum (ALS). Similar studies concerned the influence of ALS on the induction by Moloney sarcoma virus (MSV) of granulomatous tumors. Further, attempts were made to reverse the effects of ALS using adoptively transferred syngeneic sensitized and nonsensitized splenic or lymph node cells. Finally, normal sera and sera from hyperimmunized syngeneic donors were used following virus infection in an effort to reverse the neoplastic process during the latent period. The mice were found to become strikingly sensitive to either MLV or MSV if ALS was administered prior to virus, not after. Nonsensitized lymphoid cells reversed the effects of ALS on tumor induction by MLV but not those on tumor induction by MSV. Paradoxically, sensitized lymphoid cells were ineffective in restoring immune competence. Increased susceptibility to MLV in ALS-treated mice correlated with reduced anti-MLV antibodies, but administration of hyperimmune serum during the latent period was without effect on leukemia induction. In contrast, serum from mice hyperimmunized with MSV was very effective in preventing MSV-tumor induction (although regressor sera, having high anti-MSV titer, were without effect). The results are interpreted to support the concept that the immunosuppressive effect of ALS is directly responsible for the increased susceptibility observed. It is also noted that ALS appears to remove or inactivate selectively those lymphoid cells concerned with the establishment and maintenance of immunocompetence, but to be relatively ineffective against those cells susceptible to transformation by MLV.

5084 IMMUNITY TO MURINE SARCOMA VIRUS-INDUCED TUMORS. II. SUPPRESSION OF T CELL-MEDIATED IMMUNITY BY CELLS FROM PROGRESSOR ANIMALS. *(E.)* Gorczynski, R. M. (Zool. Dep., Univ. Coll. London, England). *J Immunol* 112(5):1826-1838, 1974.

Spleen and lymph node cells of progressor BALB/c mice infected 10-14 days earlier with murine sarcoma virus (MSV) showed no demonstrable immunity to MSV antigen when tested *in vitro*. On fractionation of the spleen cells by velocity sedimentation, large and small cells could be detected which reacted well with this antigen. A cell population of intermediate size is capable of suppressing this activity. Treatment of these suppressor cells with anti-immunoglobulin serum suggested that they have immunoglobulin moieties on the surface. The suppression is non-specific since phytohemagglutinin stimulation of protein synthesis by normal lymphocytes was also suppressed by these cells.

5085 LEUKEMIA VIRUS-IMDUCED IMMUNOSUPPRESSION. X. DEPRESSION OF T CELL-MEDIATED CYTOTOXICITY AFTER INFECTION OF MICE WITH FRIEND LEUKEMIA VIRUS. *(E.)* Mortenson, R. F. (Dept. Microbiol., Pennsylvania State Univ., University Park), W. S. Ceglowski and H. Friedman. *J Immunol* 112(6): 2077-2086, 1974.

Cell-mediated cytolysis of allogeneic target cells by lymphocytes of sensitized leukemia-susceptible BALB/C mice was rapidly depressed by infection with Friend leukemia virus (FLV), in doses of 5, 50 and 500 ID_{50}, after sensitization with alloantigen. For cytolytic assay, labeled target cells (10^5 in 0.1 ml) were added to 1 x 10^5 to 5 x 10^5 spleen lymphocytes. After incubation for six hr at 37 C, the suspension was centrifuged and ^{51}Cr content was counted spectrophometrically. The percentage of specific cytolysis was based on the total amount of ^{51}Cr present in 0.5 x 10^5 labeled target cells minus the spontaneous release of ^{51}Cr (absence of lymphocytes). Cytotoxicity for allogeneic cells by lymphocytes of sensitized leukemia-resistant C57BL/6 mice was unimpaired by FLV infection after sensitization, but a significant depression occurred when FLV infection was done four days before, but not eight or more days before sensitization. It was shown that there was a decreased number of cytolytic effectors in BALB/c mice rather than diminished effectivity. The number of effectors was proportional to the dose of FLV and to the elapsed time after FLV infection. These results show that FLV is capable of suppressing this T cell dependent event in leukemia-susceptible mice.

5086 SUPPRESSION OF MITOGEN RESPONSES BY SERUM FROM TUMOUR-BEARING MICE. *(E.)* Whitney, R. B. (Dep. Microbiol., Univ. British Columbia, Vancouver, Canada) and J. G. Levy. *Eur J Cancer* 10(11): 739-745, 1974.

Stimulation of DBA/2J mouse spleen cells by a T-cell mitogen, concanvalin A (con A), and a B-cell mitogen, lipopolysaccharide (LPS), was obtained in medium supplemented with isologous serum. This system was used to investigate the effects of serum from mice bearing methylcholanthrene-induced rhabdomyosarcomas on normal spleen cell response to these mitogens. Sera from mice with large tumors (>2.5 g) were markedly inhibitory to mitogen stimulation. The degree of inhibitory activity of serum was directly related to the tumor load of the donor. Serum from mice with large tumors caused significant inhibition of the response to con A at 0.12%, whereas sera from mice with 0.60-1.0 g tumors and mice with 1.9-2.2 tumors were significantly inhibitory only at concentrations above 4.0 and 2.0%, resp. Significant inhibition of the LPS response was observed at 0.5% serum from mice with large tumors; sera from the other two groups of mice were inhibitory only at concentrations above 2.0 and 1.0%, resp. The results indicate the presence in serum from tumor-bearing animals of a factor(s) which generally inhibits lymphocyte function; such a substance could explain the frequent depression of cell-mediated immunity in patients with large tumors.

5087 HISTOCOMPATIBILITY STUDIES ON THE HUSBAND-WIFE PAIR WITH TROPHOBLASTIC NEOPLASIA. *(E.)* Yamashita, K. (Sch. Med., Hokkaido Univ., Sapporo, Japan), S. Matsuda and K. Tsuji. *Acta Obstet Gynaecol Jpn* 20(1):39-45, 1973.

To further clarify the immunoinhibitory mechanism which may exist between host and trophoblastic tumor, the degree of histocompatibility between husband-wife couples with chorioepithelioma, destructive moles, or hydatidiform moles was studied. Histocompatibility factors in the heparinized blood were tested using the MLC test and HL-A typing and the results were compared with the clinical pictures. The MLC index was significantly lower in the chorioepithelioma couples than in the hydatidiform mole couples and a group of unclassified couples; there was not significant difference between the chorioepithelioma and destructive mole couples in this respect. The four groups of couples did not differ significantly with regard to HL-A typing. Among the unclassified couples, there was no correlation between MLC index, HL-A typing, and clinical picture. In one case of destructive mole, a high value on the MLC index was correlated with resistance to treatment, and in one case of chorioepithelioma, indications of histocompatibility as shown by the MLC index and HL-A typing was correlated with a rapid clinical deterioration and death from generalized metastases. The results show no parallelism between the MLC test and HL-A typing.

5088 A PLASMA FACTOR INHIBITING LYMPHOCYTE REACTIVITY ON UROLOGIC CANCER PATIENTS. *(E.)*

McLaughlin, A. P. (Univ. Hosp., San Diego, Calif.) and J. D. Brooks. *J Urol* 112(3):366-372, 1974.

To determine whether the impaired immunologic reactivity which has been observed in urologic cancer patients is the result of a plasma inhibitory factor or an intrinsic defect in the immune T lymphocytes, plasma exchange experiments were performed using peripheral lymphocytes from 19 patients and 38 noncancer controls. The cancer group included ten patients with prostatic carcinoma, four with hypernephroma, three with bladder carcinoma, and one each with testicular tumor and adrenal carcinoma. The depressed lymphocyte reactivity to phytohemagglutinin (PHA) among the cancer patients was restored to normal values when the lymphocytes were cultured in homologous plasma obtained from control subjects. Lymphocytes from normal subjects showed normal reactivity when cultured in autologous normal plasma but showed a significant depression when cultured in homologous plasma from cancer patients. The effect of each serum protein fraction on the transformation of normal lymphocytes was determined by exchange experiments. Substitution of combined fractions one and two, but not fractions three or four, for autologous plasma in cultures of normal lymphocytes produced a significant and specific depression in lymphocyte reactivity to PHA; the effect was not due to cytotoxicity. Immunoelectrophoresis indicated that combined fractions one and two were made up largely of alpha 2 globulin. The data suggest that these alpha 2 globulins may act as immunorepressive serum factors producing inhibition of immunologic responsiveness in urologic cancer patients. Identification of these factors is clinically significant in that it may offer a new immunotherapeutic adjunct in the surgical and chemotherapeutic control of urologic cancer.

5089 TRANSPLANTATION IMMUNITY TO INDIVIDUALLY UNIQUE ANTIGENS OF CHEMICALLY INDUCED BLADDER TUMORS IN MICE. *(E.)*

Wahl, D. V. (Univ. Washington Med. Sch., Seattle), W. H. Chapman, I. Hellstrom and K. E. Hellstrom. *Int J Cancer* 14(1): 114-121, 1974.

Using immunization and challenge with transplanted tumor cells, it was determined whether common and/or individually unique antigens could be detected by resistance of mice with bladder tumors to tumor cell challenge. Two carcinomas and two sarcomas induced by 3-methylcholanthrene in female BALB/c mice were the experimental tumors. One hundred-sixty female BALB/c mice were immunized by s.c. injection with 10^5 irradiated cells on day 1, and then with 10^5 nonirradiated cells on day 12. The tumor outgrowth was excised on day 26, and the mice were challenged by s.c. injection of tumor cells on the contralateral flank on day 33. Resistance to tumor grafting occurred when the challenge and immunizing tumor were identical, but there was no evidence for the presence of tumor-specific transplantation antigens common to either the two carcinomas or the two sarcomas. The need to study the extent to which immune reactions to individually unique mouse bladder tumor antigens are detected *in vitro* is stressed.

5090 TUMOR-SPECIFIC TRANSPLANTATION ANTIGEN ACTIVITY OF FRESHLY ADENOVIRUS-INFECTED CELLS: INTERCURRENT IMMUNIZATION AGAINST VIRAL TUMORIGENESIS WITH VIRUS-INFECTED CELLS. *(E.)*

Nakajima, S. (Inst. Viral Res., Kyoto Univ., Japan), C. Hamada and H. Uetake. *Jpn J Microbiol* 18(3):243-252, 1974.

The prevention of viral carcinogenesis in neonatal hamsters by intercurrent immunization was described. Within 24 hr of birth s.c. injection of 10^6 $TCID_{50}$ human adenovirus (Ad-12) caused 80% incidence of tumors by day 90 after infection. Injection, s.c., of 10^7 Ad-12-infected tumor cells or a 10^8 $TCID_{50}$ Ad-12 virus dose 15 days after neonatal virus challenge, reduced tumor incidence to 10%. To determine whether immunization was due to virus particles or donor tumor cell surface transplantation antigens, virus-infected tumor cells treated with FUdR were used to curtail free virus particles but retain cell-surface borne viral antigens. Such cells still prevented viral carcinogenesis even though it was calculated that residual virus could reach a titer of 10^6 $TICD_{50}$ maximum after *in vivo* replication. Injection of an immunizing dose of FUdR-treated cells resulted in less circulating anti Ad-12 antibody than an immunizing dose of infectious Ad-12 virus, suggesting that the anticarcinogenic effect was unrelated to the amount of humoral antibody. Other experiments showed that intercurrent immunization was specific for the virus (other strains of human adenovirus were ineffective) but not specific for the virus-carrying cell. These results are considered as evidence for the concept of cell-mediated immunity to virus-induced carcinogenesis.

5091 GROWTH AND IMMUNOGENICITY OF MURINE B-16 MELANOMA. *(E.)*

Bystryn, J. (New York Univ. Sch. Med., N.Y.), R. S. Bart, P. Livingston and A. W. Kopf. *J Invest Dermatol* 63(4):369-373, 1974.

Murine B-16 melanoma, which arose spontaneously in a C57BL/6 mouse, was used as a model for the study of human malignant melanoma. Viable B-16 melanoma cells were inoculated (s.c.) into C57BL/6 mice; the number of tumor cells inoculated was increased, the latent time to tumor appearance decreased, and the tumor incidence and mortality rate increased. Increasing the tumor dose from 10^4 to 2×10^6 cultured cells decreased the average latent time to tumor appearance from over 40 days to 9 days; tumor incidence 30 days post inoculation was increased from 10% to 100% and survival decreased from 100% to 37%. A relationship was present between increasing tumor dose and increasing tumor incidence in two experiments, but the actual incidence with a particular dose of cells differed. In studies with fresh melanoma cells increasing tumor dose from 5×10^5 to 2×10^7 cells decreased the average latent time to tumor appearance from 22 to 4 days; tumor incidence 30 days post inoculation was increased from 67% to 100% and survival decreased from 67% to 0%. Mice immunized with B-16 melanoma were partially immune to challenge with melanoma cells; mice immunized with mammary adenocarcinoma had a slightly increased resistance to melanoma which was not statistically significant. Prior immunization with B-16 melanoma inhibited subsequent growth of mammary adenocarcinoma significantly in 1/2 experiments. Sera of immunized mice bound more radiolabeled melanoma-associated antigens than did normal mouse sera. Higher antibody levels correlated with increased resistance to challenge with lethal doses of melanoma cells. Active immunization of syngeneic mice with B-16 melanoma induces partial immunity to lethal doses of this tumor and indicates that B-16 melanoma is antigenic.

5092 CELL-SURFACE ANTIGENS OF MURINE SARCOMA-VIRUS-TRANSFORMED NON-PRODUCER CELLS: FURTHER EVIDENCE FOR LACK OF TRANSPLANTATION IMMUNITY.

(E.) Greenberger, J. S. (Natl. Cancer Inst., Bethesda, Md.), J. R. Stephenson, T. Aoki and S. A. Aaronson. *Int J Cancer* 14(2):145-152, 1974.

The detection of a weak sarcoma virus-associated transplantation antigen under conditions shown to elicit antibodies specific for the murine sarcoma virus non-producer cell surface was attempted by challenge with murine sarcoma virus non-producer BALB/3T3 cells and also by *in vivo* inoculation of murine sarcoma virus. Mice of the BALB/c strain, hyperimmunized with a murine sarcoma virus-transformed non-producer clone of BALB/3T3 cells, failed to demonstrate a higher resistance than BALB/3T3 hyperimmunized mice to tumor induction by either the homologous non-producer cells or murine sarcoma virus. Under these conditions, both murine sarcoma virus non-producer cell hyperimmunized tumor-bearing and non-tumor-bearing mice showed antibodies to the murine sarcoma virus-associated cell surface antigen. Thus, even in mice possessing this antibody, there is no transplantation immunity to murine sarcoma virus non-producer cells. The results confirm and extend previous studies indicating that cells non-productively transformed by an RNA-containing sarcoma virus lack detectable transplantation antigens.

5093 RELATIONSHIP BETWEEN HUMORAL ANTIBODIES AND THE FAILURE TO DEVELOP PROGRESSIVE TUMORS IN CATS INJECTED WITH FELINE SARCOMA VIRUS (FSV).

(E.) Essex, M. (Karolinska Inst. Sch. Med., Stockholm, Sweden), S. P. Synder and G. Klein. *Bibl Haematol* (39):771-777, 1973.

To investigate the relationship between the development of progressive tumors and the production of humoral antibody in cats injected with feline leukemia virus (FeLV), cats were injected at different ages since resistance increased with age. The assay system was an indirect immunofluorescence technique employing a feline lymphoblastoid target cell which replicated the Kawakami-Theilen strain of FeLV, two-fold dilutions of serum, and fluorescein-conjugated antiserum to cat IgG. The antibodies reacted with the membrane antigen complex of the infected target cells. An inverse correlation was found between the development of progressive tumors and antibody titers. A positive correlation was found between the ability of newborn kittens to resist development of progressive tumors following FSV injection and the presence of antibodies at the time of virus injection. It was suggested that in this case the antibodies were obtained passively from mothers who were exposed to FeLV. Antibodies were also found in dogs with regressing FSV-induced tumors. It is suggested that the absence or low levels of humoral antibody in cats with progressive tumors is due to absorption of circulating antibody to tumor cells or to impaired ability of progressor animals to produce this antibody.

5094 ANTIBODIES TO EPSTEIN-BARR AND OTHER VIRUSES IN CHILDREN WITH ACUTE LYMPHOBLASTIC LEUKAEMIA.

(E.) Sutton, R. N. P. (King's Coll. Hosp. Med. Sch., London, England), S. D. Marston, H. J. M. Pullen, C. W. Darby, D. I. K. Evans and R. T. D. Emond. *Arch Dis Child* 49(7):540-544, 1974.

Sera from children with acute lymphoblastic leukemia, infectious mononucleosis, other infectious diseases, congenital abnormalities, and other miscellaneous conditions were tested for antibodies to Epstein-Barr (EB) and other viruses. Antibodies to EB virus capsid antigen were present to the same extent in the leukemic and control children, indicating identical rates of infection. EB complement-fixing (CF) antibody levels in sera which had been taken from ten children within one month of the onset of leukemia were elevated, closely resembling those in children known to have had infectious mononucleosis and differing significantly from a control group and a group with active infectious mononucleosis. Among 22 patients tested more than once, two showed large increases in EB CF antibodies; in neither case was this serological conversion associated with any remarkable clinical features. The leukemic children did not differ from the controls with respect to the prevalence of cytomegalovirus antibodies, adenovirus antibodies, hepatitis B antigen, or total IgM, IgA, and IgG immunoglobulins. The presence of EB CF antibodies in children tested within one month of the onset of leukemia suggests that they experienced an asymptomatic EB virus infection some months before their diagnosis; some recent reports indicate that this may be related to their development of leukemia.

5095 ANTIBODIES TO EPSTEIN-BARR VIRUS ASSOCIATED ANTIGENS IN BURKITT'S LYMPHOMA. *(E.)* Gunven, P. (Dep. Tumor Biol., Karolinska Inst., Stockholm, Sweden), G. Klein, G. Henle, W. Henle, P. Clifford and S. Singh. *Bibl Hematol* (39):813-817, 1973.

Three antigen systems associated with the Epstein-Barr virus were studied by immunofluorescence: membrane antigens, intracellular early antigens, and intracellular viral capsid antigens. All Burkitt's lymphoma patients studied had antibodies to intracellular viral capsid antigens and membrane antigens and a majority also to intracellular early antigens. The patients had higher titers than control groups. High anti-early antigen titers in patients brought into remissions indicated a bad prognosis as to recurrences. A decrease in antibodies to membrane antigens was seen before late tumor recurrences. BCG inoculations temporarily increased the anti-membrane antigen titers. It is suggested that the decline in anti-membrane antigen before recurrence may parallel another event that is directly responsible for the tumor outgrowth or may allow the recurrence to take place.

5096 ANTIBODIES IN CHICKENS AGAINST AVIAN LEUKOSIS VIRUS GROUP SPECIFIC ANTIGEN. *(E.)* Dougherty, R. M. (Upstate Med. Cent., Syracuse, N. Y.), H. S. DiStefano, A. A. Marucci and F. K. Roth. *Bibl Haematol* (39):732-743, 1973.

To test an earlier suggestion that most or all chickens are tolerant to avian leukemia virus (ALV) group-specific (gs) antigen by reason of the endogenous presence of occult or partly expressed ALV, antisera were prepared by immunization of chickens with ALV and were examined for antibodies to gs antigens by two procedures: complement-fixation inhibition (CFI) and immunochemistry. The CFI test detected group-specific antibodies in 51/90 chickens that had been immunized with three strains of ALV representing two envelope serotypes. Congenitally infected chickens that were immunologically tolerant to ALV type A envelope antigen were, however, also tolerant to ALV gs antigen, even though they produced neutralizing antibodies against type B envelope antigen. Immunohistochemical staining with antibody-peroxidase complexes also revealed antibodies to ALV gs antigen in most chicken antisera against ALV. Antisera containing gs antibodies reacted with fixed ALV-infected cells regardless of the envelope serotype of the infecting virus, i.e., the reaction was group-specific. In contrast, only type-specific, viral envelope antigens reacted when live infected cells were exposed to antiviral serum prior to fixation. The findings indicate that the earlier hypothesis must be discarded or modified.

5097 PREVALENCE IN ITALY OF ANTIBODIES TO A NEW HUMAN PAPOVAVIRUS (BK VIRUS). *(E.)* Portolani, M. (Inst. Microbiol., Univ. Bologna, Italy), A. Marzocchi, G. Barbanti-Brodano and M. La Placa. *J Med Microbiol* 7(4):543-546, 1974.

An examination was conducted of 453 healthy individuals by hemagglutination-inhibition (HI) and immunofluorescence to detect antibodies to other structural components of BK virus. Serum specimens were taken in Bologna and Milan, spanning a six month to 65 yr age group. Hemagglutinin (HA) and HI antibody tests were performed by microtiter methods. The immunofluorescence method utilized BK virus or simian virus 40 (SV40)-infected Vero cells grown on a coverslip for four days, fixed in acetone and stained by indirect fluorescent-antibody (FA) technique. A high incidence of HI and FA was seen in the population. A minimum frequency of 47.8% by HI and 39.1% by FA was seen at age two years; a maximum frequency was seen at age 16-25 years of 82.9% by HI and 78.0% by FA. A slight sex difference was noted with males possessing the higher frequency. The data imply that antibodies to BK virus are common in the population studied. The author suggests that the infections occurred during early childhood.

5098 THE THREE-DIMENSIONAL STRUCTURE OF A PHOSPHORYLCHOLINE-BINDING MOUSE IMMUNOGLOBULIN FAB AND THE NATURE OF THE ANTIGEN BINDING SITE. *(E.)* Segal, D. M. (Natl. Cancer Inst., Bethesda, Md.). *Proc Natl Acad Sci USA* 71(11):4298-4302, 1974.

The three-dimensional structure of the antibody fragment (Fab) of a mouse myeloma phosphorycholine (PC)-binding immunoglobulin A was determined. X-ray diffraction crystallography revealed stereostructure to within 3.1 Å and amino acid sequencing gave the qualitative composition of the heavy and light chains. This Fab, coded IgA(K) 603, is very similar to a previously reported human Bence Jones protein and its overall dimensions are 40 x 50 x 75 Å arranged in two globular regions. Each region is divided into constant and variable domains with a double-layer structure composed of heavy and light chains. One end encloses a bowl-shaped cavity lined with hypervariable amino acid residues which form the PC-binding site. This cavity is 12 Å deep x 15 Å x 20 Å and is only partly occupied by the bound PC. PC is bound asymmetrically to defined amino acid residues and more to the heavy chain than the light chain. These results show that antibody molecules share a remarkably close similarity in many of their tertiary and quaternary structures. However there are still many sites of variation, particularly in the chemical composition of the antigen-binding site, to account for antibody specificity.

5099 IMMUNOGLOBULIN COATING OF HUMAN CANCER CELLS: CORRELATION WITH CLINICAL BEHAVIOUR. *(E.)* Ran, M. (Dep. Microbiol., Tel-Aviv Univ., Israel), I. P. Witz, E. Landes, H. J. Brenner and F. C. Izsak. *Proc Fifth Int Symp Biol Characterization of Hum Tumors, Bologna, April 4-6, 1973* 1:244-249, 1974.

The presence or absence of an immunoglobulin layer coating the tumor cells was correlated with the histological degree of malignancy of tumors studied from 25 patients (21 women and four men, 23-77 yr). Breast cancer occurred in 9/25 patients, colon cancer in 5/25 patients, gastric cancer in 2/25 patients and rectal cancer in 2/25 patients; one patient each had vulva, ovarian, hypernephroma, chondrosarcoma, and leiomyosarcoma disease. Immunoglobulin coating was demonstrated (by low pH elution and specific fixation by tumor cells of radioiodine-labeled anti-human IgG) on the surface of tumor cells in 14/25 specimens; 9/14 cases were high grade malignancy and 5/14 cases were low grade malignant tumors. Immunoglobulin coating was seen in 9/12 high grade malignancy tumors and in 5/13 low grade malignancy tumors. Normal tissue from tumor-bearing patients was found to be coated by immunoglobulin only in cases in which the tumor was of a high grade malignancy. These results support the hypothesis that *in vivo* coating of tumor cells with anti-tumor antibody or with complexes between tumor antigen and anti-tumor antibody may inhibit the destruction of coated cells.

5100 SURFACE IMMUNOGLOBULIN OF A MOUSE T-CELL LYMPHOMA.

(E.) Boylston, A. W. (St. Mary's Hosp. Med. Sch., London, England) and J. F. Mowbray. *Immunology* 27(5):855-861, 1974.

The isolation and some physical characteristics of a cell surface immunoglobulin on a lymphoma cell line derived from C57Bl mice was described. Cells were labeled on the surface with ^{125}I by the lactoperoxidase method, washed and dispersed in 9 M urea and 1.7 M acetic acid at 37 C for two hr, and the 40,000 g supernatant was dialyzed for immunoglobulin analysis. Immunoglobulin components were adsorbed onto an anti-mouse kappa immunoglobulin sepharose column, washed and eluted with boiling detergent/urea mixture or 7 M guanidine (pH 2). Acrylamide gel electrophoresis resolved this material into three fractions of which two were immunoglobulins, as revealed by mercaptoethanol reduction. The two Ig fractions appeared to be heavy and light chains of molecular weight 170,000 and 64,000 daltons resp. This method is useful for large scale preparation of surface immunoglobulin.

5101 VARIANTS OF MOUSE MYELOMA CELLS THAT PRODUCE SHORT IMMUNOGLOBULIN HEAVY CHAINS.

(E.) Birshtein, B. K. (Albert Einstein Coll. Med., New York, N. Y.), J. L. Preud'homme and M. D. Scharff. *Proc Natl Acad Sci USA* 71(9):3478-3482, 1974.

Six variant clones producing immunoglobulin heavy chains shorter than those of the parent were isolated after mutagenesis of cultures cells of mouse myeloma tumor MPC-11 with ICR-191 (1 μg/ml) Melphalan (0.4-0.6 μg/ml) for 24 hr. Variants were characterized serologically by immunodiffusion analysis of cytoplasm and supernatants and by electrophoresis. These variants fell into a type (1) which synthesizes heavy chains, molecular weight about 50,000, and another type (2) which synthesizes heavy chains, molecular weight about 40,000. In five of the six variants the light chains are the same size and comparative peptide maps of two of these are identical. In the sixth variant the light chain is shorter than that of the parent. Ouchterlony analysis of cell lysates and secretions with four antisera showed serological differences between variants and parent, and between the two types of variants; both variants lacked antigenic determinants recognized by Fc and IgG_{2b} antisera. Heavy chains secreted by type 1 variants did not react with antiserum against completely reduced and alkylated MPC-11 heavy chain while the secretions of type 2 variants reacted well with this antiserum. Comparative peptide analysis by ion exchange chromatography showed structural differences between heavy chains of parent and variants, and between variants. When one clone of type 1 was recloned, about one third of its subclones showed the type 2 phenotype. The high incidence of variants could reflect something unusual in the biochemical genetics of the multigene system responsible for immunoglobulin production and/or the variant proteins could possibly arise from "silent" genes turned on by ICR 191 or Melphalan.

5102 SERUM IMMUNOGLOBULIN LEVELS IN CHRONIC LYMPHATIC LEUKAEMIA.

(E.) Slungaard, A. (La Crosse Lutheran Hosp., Wisconsin) and M. J. Smith. *Scand J Haematol* 12(2):112-116, 1974.

A study was made of the serum immunoglobulin deficiencies in chronic lymphatic leukemia (CLL) patients to determine whether an age, sex or race relationship exists. Fourty-four CLL patients and 45 controls, predominantly of Norwegian and German extraction, yielded serum for analysis. Radial immunodiffusion in agar was used to measure IgG, IgA and IgM levels. CLL patients ranged in age from 56 to 86 with 29 males and 15 females (both with mean ages of 71). Control patients ranged in age from 51 to 90 with 27 males with a mean age of 70 and 18 females with a mean age of 74. CLL males showed a decrease in all three immunoglobulin levels, while females with CLL showed reduction only in IgA. Multivariate linear discriminant functions for each sex showed a high Z value for normal patients and a low Z value for those with CLL. The data suggest that immunoglobulin reductions in CLL are independent of age, sex and race and that the reductions are probably attributable to CLL.

5103 DEMONSTRATION OF IMMUNE ADHERENCE-BLOCKING FACTORS IN CELL-FREE TUMOROUS ASCITES.

(E.) Kaneko, Y. (Dep. Antibiot., Natl. Inst. Health, Tokyo, Japan) and K. Nitta. *Gann* 65(3):201-205, 1974.

Male ddY mice were inoculated s.c. or i.p. with 2 x 10^6 Ehrlich carcinoma cells, and 5-12 days later their serum antibody against Ehrlich cells measured by immune adherence. There was no substantial difference in the serum activity between ascites and solid tumor bearers. There was no antibody activity in the supernatant of the ascites of mice carrying Ehrlich ascites carcinoma 10-12 days after inoculation, although there was a high activity in the serum of the same animals. Immune adherence tests performed on Ehrlich cells from 10-21 day ascites without the addition of antiserum give negative results. When Ehrlich carcinoma cells were transferred i.p into mice immunized against Ehrlich carcimoña and collected four hr later, 24% of the cells gave positive immune adherence; no Ehrlich cells passed through nonimmunized mice gave positive reactions. The cell-free supernatant of Ehrlich ascites 9-13 days after the i.p. inoculation of Ehrlich cells reduced the appearance of immune adherence-positive cells 50-80% when it was mixed with sera from mice carrying Ehrlich ascites tumor. Fractionation of the cell-free Ehrlich ascites showed that the strongest inhibiting activity was found in the fraction with a molecular weight larger than 100,000; moderate activity was found in the 10,000-100,000 and 500-10,000 fractions. Ascites fluids from mice carrying the ascites type of sarcoma-180 or leukemia SN-36 blocked the immune adherence produced by the reaction between Ehrlich cells and anti-Ehrlich antibody. Pretreatment of Ehrlich cells with Ehrlich ascites fluid did not affect their immune adherence reaction. The results confirm the presence in Ehrlich carcinoma of at least three factors which inhibit the immune adherence reaction, and suggest that the blocking factors in the ascites may play an important role in the development of ascites tumors which are rejected when transplanted s.c.

5104 STUDIES ON THE IMMUNOLOGIC REACTIVITY OF SERA FROM ACUTE LEUKEMIA PATIENTS. *(E.)*

Mann, D. L. (Natl. Cancer Inst., Bethesda, Md.), C. Ulmer, A. Le Pourheit, B. Leventhal and R. Halterman. *Prog Exp Tumor Res* 19:102-109, 1974.

Using a previously developed rabbit antiserum to a tumor-specific cell surface antigen (derived from a human lymphoma line with demonstrated cytotoxity to human lymphocytic and myelocytic leukemia cells), some degree of human leukemic serum blocking activity to this complement-dependent cytoxicity test system was demonstrated. Of 39 serum samples from patients with acute lymphocytic or myelocytic leukemia, 28 were non-cytotoxic to target leukemic cells and blocked the cytotoxic effects of rabbit antisera. These sera were all from recently diagnosed patients or patients in relapse, whereas sera from six patients in remission were neither cytotoxic nor contained blocking activity. Five sera were cytotoxic but did not contain blocking activity. After sephadex gel column fractionation, two components, corresponding to the appropriate molecular sizes for antigen-antibody complex and free antigen were isolated; both contained blocking activity. The results provide further evidence that human leukemic cells can be antigenic, but host immune response is inhibited by serum blocking factors.

5105 ANTIGENIC DELETION IN CERVICAL NEOPLASIA. *(E.)*

Ashley, C. (Dep. Obstet. Gynecol., Univ. Adelaide, Australia), J. A. Kirkland and M. A. Stanley. *Pathology* 6(4):329-335, 1974.

Specific antigen changes were followed in an indirect immunofluorescence study of biopsies from 18 patients with abnormal cytology or clinical carcinoma of the cervix; biopsies were also obtained from 18 patients with normal cytology and a clinically benign cervix. Inflammation did not seem to alter the staining pattern significantly in six cases of chronic cervicitis. In patients with hyperplasia, a benign epithelial change showed a normal intensity of fluorescent staining in 2/3 patients and a moderately lower intensity in 1/3 patients. Minor deletion of intercellular antigen staining was evident in the lower epithelial layers of 1/3 patients with dysplasia. Deletion was evident in the immunofluorescent staining pattern of all eight patients with carcinoma *in situ*. Low but specific levels of intercellular antigen remained in some cases. Complete or almost complete absence of intercellular immunofluorescent staining showed in six cases of invasive squamous cell carcinoma. No change in basement membrane antigen staining occurred in inflammatory or hyperplastic epithelia; staining was as intense in the dysplastic lesions as in normal epithelium. No significant differences in the basement membrane antigen levels were observed in the carcinoma *in situ* cases which had variable amounts of antigen. It is concluded that there is almost complete absence of normal intercellular and basement membrane antigens in the invasive malignant state, but that these antigens persist in benign conditions.

5106 STUDIES ON THE EXPRESSION OF LEUKEMIA VIRUS-CONTROLLED CELL SURFACE ANTIGEN AND INFECTIOUS VIRUS RELEASE. *(E.)*

Fenyo, E. M. (Karolinska Inst., Stockholm, Sweden), G. Grundner and E. Klein. *Bibl Haematol* (39):712-719, 1973.

The relationship between the formation of murine leukemia virus-induced cell surface antigens and the production of mature virus particles was investigated with the aid of cultures of four different hybrid lines of mouse tumor cells. The parent lines were two Moloney lymphoma lines, YAC and YACIR, and an 8-azaguanine-resistant subline of the L cell, A9. The different parents differed from one another as to induction of antigen or production of virus. The hybrids, YAC-A9 and YACIR-A9, were selected for ability to induce tumors, the tumors then being recultured for use in the experiments. Antigens were measured by immunofluorescence; virus production, by ability of culture media to infect JLS-V9 indicator cells. It was concluded from the results that the expression of viral surface antigen and release of infectious virus are not related and that by manipulations with the genetic material (introducing chromosomes by hybridization and eliminating them by selection), the virus-related traits appear in various combinations and quantities. In this way a releaser line could be obtained from a non-releaser line. Since the assembly of non-infectious particles was not investigated, the possibility could not be excluded that such particles were formed and that their production was more closely correlated with the expression of the membrane antigen.

5107 ERYTHROCYTE MEMBRANE-SPECIFIC ANTIGENS IN FRIEND VIRUS-INDUCED LEUKEMIA CELLS. *(E.)*

Ikawa, Y. (Natl. Cancer Inst., Bethesda, Md.), M. Furusawa and H. Sugano. *Bibl Haematol* (39):955-967, 1973.

Inbred albino DDD mice developed enlarged spleens five-seven wk after inoculation with Friend virus

(0.1 ml of 10^{-3} dilution of a 10% saline homogenate of enlarged spleens). The neoplastic cells of the spleens had the same antigens as normal erythrocytes as shown by fluorescein-labeled antibody staining which supports the hypothesis that Friend-virus-induced leukemia in DDD mice is malignant erythroblastosis. Cells of transplantable spleen focus-derived ascites tumors 3, clones 1 and 2 had negative fluorescence. However, when these cells (2-5 x 10^5 cells) were cultured in the peritoneal cavity of syngeneic DDD mice (in diffusion chambers sealed with 0.45 μm millipore membrane filters), most of the corpuscles were fluorescence-positive. After four to nine days incubation the cells were stained (May-Grunwald Giemsa) and yielded several stages of erythrocyte maturation. Undifferentiated leukemia cells frequently showed virus particles budding and type C particles in the intracytoplasmic inclusions. Addition of dimethyl sulfoxide (2%) to cultures of the above cell lines resulted in erythrocyte maturation and most of the cells became positive for erythrocyte-membrane specific antigen. The mechanism of antigen appearance in these chemically-induced erythroid leukemia lines is uncertain at this time. The specific antibody against normal erythrocyte membrane used to demonstrate malignant erythroblastosis in Friend virus-induced leukemia may soon be used in differential diagnosis of undifferentiated leukemia.

5108 CHARACTERISTICS OF HETEROLOGOUS MEMBRANE ANTIGEN ON CULTURED HUMAN CELLS. *(E.)*

Irie, R. F. (Sch. Med., Univ. California, Los Angeles), K. Irie and D. L. Morton. *J Natl Cancer Inst* 53(6): 1545-1551, 1974.

The characteristics of a new heterologous membrane antigen (HM Ag) on two sublines of a human sarcoma cell line (SA-2) were studied by immune adherence. HM Ag was incorporated into the membranes of cultured cells grown in media containing bovine serum. When the cells were transferred into medium containing human serum, the HM Ag was gradually lost, indicating that natural antibody against the antigen exists in human sera. HM Ag was removed from the cell membranes of SA-2 cells grown in media with fetal calf serum (FCS) after the cells were transferred into agamma human serum (2-3 wk) or into whole human serum (1-2 weeks). Cells grown in human serum reincorporated HM Ag into their membranes within 24 hr after transfer to medium containing 20% FCS. The incorporation did not occur at 0 C and was suppressed with metabolic inhibitors (puromycin, actinomycin D, and mitomucin C). Treatment with neuarminidase removed the antigen, although treatment with proteinase did not. Anti-HL-A antibody reactivity was higher toward cells grown in the presence of agamma human serum than to cells grown in FCS. HM Ag was incorporated into the bovine tissues *in vivo* from the bovine bloodstream. The integration of HM Ag into cell membranes might influence the results of experimental immunotherapy and skin hypersensitivity tests in cancer patients as well as the results of *in vitro* immunologic studies in man when cells cultured in FCS are used. The antigen can be excluded from bovine-cultured human cancer cells by changing the medium from FCS to human serum, inactivating or removing HM Ag directly from the cells grown in medium with FCS, or absorbing anti-HM Ag antibody with cells carrying HM Ag.

5109 SOLUBILIZATION OF MEMBRANE-ASSOCIATED TUMOUR-SPECIFIC ANTIGENS BY β-GLUCOSIDASE.

(E.) Baldwin, R. W. (Cancer Res. Campaign Lab., Univ. Nottingham, England), J. G. Bowen and M. R. Price. *Biochim Biophys Acta* 367(1):47-58, 1974.

The effects of various enzyme treatments on aminoazo dye-induced rat hepatoma cells or cell membranes and the resulting degradation or solubilization of membrane-associated tumor-specific antigen was studied. Viable hepatoma D23 cells originally induced in a male Wistar rat were treated and the effects on expression of hepatoma D23 specific antigen were assessed with the membrane immunofluorescence test. β-Glucosidase modified the cell surface, causing loss of tumor-specific antigenic activity so that cells did not react significantly with antibody from hepatoma D23 immune serum. α-Glucosidase was ineffective and treated cells still reacted positively with immune serum. β-galactosidase, hyaluronidase, neuraminidase, and ficin had no effect upon cell surface-expressed antigenic activity. The antigenic determinant is susceptible to release from the tumor membrane or inactivation *in situ* by papain and β-glucosidase. DEAE-cellulose column chromatography of β-glucosidase-solubilized hepatoma D23 extranuclear membranes showed two discrete peaks of material which significantly reduced the fluorescence index of adsorbed sera below 0.30. Further studies with the isolated peak fractions showed that, although glycolytic activity of β-glucosidase is necessary for antigen solubilization, the involvement of a proteolytic enzyme system may play an essential role in release of antigenically active macromolecules.

5110 APPARENT HL-A 5 DEFICIENCY IN HUMAN MALIGNANT MELANOMA. II. HL-A 5 MASKING ACTIVITY IN SERA OF PATIENTS WITH PROGRESSING DISEASE.

(E.) Clark, D. A. (Tufts Univ. Sch. Med., Boston, Mass.), T. F. Necheles, L. Nathanson, D. Whitten, E. Silverman and A. Flowers. *Isr J Med Sci* 10(8): 836-846, 1974.

This study was a follow-up of a previous finding that a human transplantation antigen, HL-A 5, is frequently deleted from the surface of lymphocytes of melanoma patients and may also be deleted from the lymphocytes of their close relatives. This wider survey showed familiar, but anomalous, transmission of HL-A 5 deletion in melanoma patient relatives that at first suggested an acquired characteristic. Further study showed that the HL-A defect was caused by an HL-A 5 masking factor in the serum of melanoma patients; an effect that was revealed by improved serological methods. Masking activity in melanoma patients was directly related to disease status, being absent in patients in remission. The HL-A 5 masking activity is a superior biological marker for human melanoma; it is more specific than other types of "masking" markers such as serum blocking factor.

5111 HL-A ANTIGENS IN MALIGNANT MELANOMA. *(E.)*

Singal, D. P. (Dep. Pathol., McMaster Univ., Hamilton, Canada), P. B. Bent, P. B. McCulloch, M. A. Blajchman and R. G. C. MacLaren. *Transplantation* 18(2):186, 1974.

The microdroplet lymphocyte cytotoxicity test was used to determine the frequency of HL-A antigens in 33 patients with malignant melanoma (MM). The results were compared with healthy unrelated controls of the same ethnic origin living in the same area. The data did not show any significant difference in HL-A antigen frequency. The data emphasize the risk of assuming an association between HL-A antigens and disease, especially when a limited number of patients are tested.

5112 HL-A ANTIGENS AND ACUTE LYMPHOCYTIC LEUKEMIA. *(E.)*

Davey, F. R. (Upstate Med. Cent., State Univ. New York, Syracuse), J. B. Henry and A. J. Gottlieb. *Am J Clin Pathol* 61(5):662-665, 1974.

An examination of the association of HL-A determinants and halotypes with increased susceptibility to acute lymphocytic leukemia, and of whether HL-A antigens or antigens crossreacting with HL-A antisera fluctuate during the active clinical phase of acute lymphocytic leukemia was made. Twenty-four Caucasian patients were compared (six during relapse) with unmatched, unrelated normal controls for 20 HL-A specificities using HL-A typing. The HL-A determinant frequency in patients and the HL-A antigen frequency in controls showed no significant difference. HL-A halotype frequencies in patients and controls also showed no significant difference. Three patients typed during relapse with multiple HL-A antisera showed additional cytotoxic reactions. The results imply no association between HL-A specificities and acute lymphocytic leukemia. The author suggests the additional cytotoxic reactions may be due to neoantigens or the uncovering of existing antigens that crossreact with the HL-A determinants.

5113 ANTIGENIC DETERMINANTS SHARED BY POLYPEPTIDES OF FELINE LEUKAEMIA VIRUS. *(E.)*

Jarrett, O. (Anim. Leuk. Res. Unit, Glascow, Scotland). *Bibl Haematol* (39):810-812, 1973.

When purified feline leukemia virus (FeLV) was degraded with sodium dodecyl sulphate and the viral proteins were separated by electrophoresis on polyacrylamide gels, ten individual bands were seen after the gels were stained with amido black. Corresponding peaks of radioactivity were found in gels when proteins from virus labeled with ^{14}C-amino acid mixtures or ^{3}H-leucine were subjected to electrophoresis. The molecular weights of these polypeptides, as determined by comparison with the distance migrated by marker proteins, were 81,000, 72,000, 62,000, 50,000, 48,000, 42,000, 38,000, 31,000, 19,000, and 15,000, resp., and the polypeptides were designated VP 1-10. To determine the antigenic relationships of some of the polypeptides, tests for cross reactivity were carried out by gel diffusion. After elution from the acrylamide gel, a mixture of VP 1 and 2 reacted in gel diffusion tests with antibody to the FeLV gs-1 antigen, as also did VP 8. Further, antibody prepared in rabbits to VP 1 and 2 reacted with both VP 1 + 2 (producing 2 precipitin lines) and VP 8, giving a line of identity, and also with FeLV gs-1 antigen present in leukemic tumor homogenates and in ether-disrupted FeLV. The results are compatible with the possibility that VP 8 is present in the virion in a larger molecule (perhaps VP 1 and 2) which is broken down on treatment with detergents, or that VP 8 is present in more than one location in the virion and at certain sites in a complex with one or more polypeptides to constitute VP 1 and 2.

5114 THE SV40 "S" ANTIGEN AND OTHER PAPOVAVIRUS-INDUCED SURFACE ANTIGENS. *(E.)*

Collins, J. J. (No affiliation given) and P. H. Black. *Curr Top Microbiol Immunol* 63:153-184, 1974.

A hypothetical model for the appearance of virus-induced host coded surface antigens on virus transformed cells was developed. It is suggested that the virus coded T antigen can activate certain host coded sugar transferases (ST) by binding to them (ST-T) and thereby interfering with normal membrane biosynthesis and/or organization. The inability to transfer the sugar from the nucleotide-sugar pool to the membrane acceptor could then lead to the appearance of previously concealed membrane antigens. In addition, the specificity of the normal covering isoantigens is suggested to be at least partially dependent on the presence of the particular sugar. The model is presented in terms of the transformation by simian virus 40 (SV40) of three different cells of the same species containing at least some isoantigens which are distinct. Results obtained in earlier studies are completely in accord with the model. The experiments with SV40-transformed outbred hamster cells demonstrate that at least some of the surface antigens which appear subsequent to virus transformation are unique for an individual transformed cell line and need not be present on other SV40-transformed hamster kidney cells.

5115 RNA TUMOR VIRUS ANTIGEN EXPRESSION IN CHEMICALLY-INDUCED TUMORS. SIGNIFICANCE OF CHEMICAL CARCINOGENS TO THE DEREPRESSION OF THE C-TYPE RNA VIROGENE AND ONCOGENE EXPRESSIONS. *(E.)*

Whitmire, C. E. (Natl. Cancer Inst., Bethesda, Md.), R. A. Salerno, L. S. Rabstein and R. J. Huebner. *Bibl Haematol* (39):574-588, 1973.

Inbred C57BL/6Cum[2], random bred NIH Swiss Webster, inbred C3H/fMai, and inbred BALB/cCr[3] mice were used to test the significance of the endogenous C-type RNA viral genome in chemically-induced tumors. Mice of three ages were used: less than 72 hr, four wk, and 13-17 months. Benzo(a)pyrene (BP), 3-methylcholanthrene (3MC), and 7,12-dimethylbenz(a)anthracene (DMBA) were dissolved in trioctanoin to obtain the desired concentrations and were inoculated s.c. or i.m. The tumor incidence (tumors/total) in the four strains of mice were significantly greater when induced by 3MC than by DMBA, and corresponded to the incidence of group specific antigens (positive sam-

s/total samples). S.c. treatment with 25 µg (0.5
of 3MC resulted in the following tumor and group
cific antigen incidences resp.: C3H/fMai (23/25,
0), Swiss (10/25, 5/9), BALB/cCr^3 (10/25, 4/9),
BL/6Cum^2 (5/25, 1/5). Using DMBA resulted in the
lowing tumor and group specific antigen inci-
ces resp.: C3H/fMai (8/26, 5/8), Swiss (5/24,
), BALB/cCr^3 (11/25, 4/9), and C57BL/6Cum^2 (5/28,
). BALB/c mice inoculated s.c. with 25 µg of 3MC
a tumor incidence of 9/15 and a group specific
igen incidence of 7/8. I.m. injection resulted
a tumor incidence of 10/17 and a group specific
igen of 5/6. S.c. injection of 25 µg of DMBA
lded a tumor incidence of 4/9 and a group spe-
ic antigen of 3/4 while i.m. injection resulted
a tumor incidence of 4/9 and a group specific an-
en of 2/4. Increasing the dosage to 100 µg in-
ased the tumor incidence only when 3MC was in-
ted i.m. Tumor incidences and group specific an-
ens in 13-17 month old C3H/fMai mice injected
. (150 µg) were as follows: 3MC (17/20, 8/14),
A (8/21, 5/8), and BP (14/23, 8/13). Under the
ve conditions mice 1-3 days old and four weeks
showed no significant difference in tumor in-
ence, latency or group specific antigen occur-
ce. The normal muscle tissue of all animals was
formly negative for group specific antigen. The
idence of C-type RNA virogene expression (group
cific antigen) found in the induced tumors did
change with increased carcinogen dosage but
increase with age. According to the oncogene
ory, virogene (group specific antigen) and onco-
e (tumor) expressions of the C-type RNA genome
induce cancer as evidenced above. Differences
the tumor inducing effects of the carcinogens
ld be due to variations in the host gene regula-
y mechanisms.

6 MULTIPLE DISTINCT ANTIGENIC DETERMINANTS ASSOCIATED WITH MURINE TYPE-C VIRUS GROUP-
CIFIC ANTIGEN.

(E.) Davis, J. (Flow Lab., Inc.,
kville, Md.), H. P. Charman, S. Oroszlan and R.
Gilden. *Intervirology* 2(6):326-336, 1974.

improve the methodology for determining the pre-
ce of type-C virus antigens in human materials,
dies were made of cross-reactive determinants
degraded type-C virus antigen. Three serologically
ive fragments were identified in tryptic digests
iodinated major group-specific antigen (p30) of
ine leukemia virus (MuLV). Two of these fragments
e eluted in a single zone on Sephadex G-50 and
rose gels developed with guanidine·HCl, with an
arent molecular weight of 11,500. Approximately
of the radioactivity in this zone was precipi-
ed with antiserum to a tryptic fragment purified
isoelectric focusing (IEFP, molecular weight
300). The remaining radioactivity was precipita-
by antisera to homologous and heterologous p30's
m feline leukemia virus. A smaller fragment
lecular weight 2,500), not found in IEFP, was
arently derived from material in this zone. Di-
t radioimmunoassays and inhibition tests estab-
hed that species-specific and interspecific deter-
ants were present on each fragment. The assay
h the ^{125}I-labeled small fragment was inhibited
optimally with trypsinized p30 and showed an increase of 130-fold in sensitivity compared to inhibition tests with intact p30.

5117 MOLECULAR SIZE OF CARCINOEMBRYONIC ANTIGEN IN THE PLASMA OF PATIENTS WITH MALIGNANT DISEASE.

(E.) Pletsch, Q. (Univ. Kentucky Med. Cent., Lexington) and D. M. Goldenberg. *J Natl Cancer Inst* 53(5):1201-1204, 1974.

The Hansen Z-gel technique was used to characterize the molecular size of the carcinoembryonic antigen (CEA) in the venous plasma of patients with various malignancies. Plasma from patients with metastatic colon cancer, metastatic adenocarcinoma of the ovary, squamous cell carcinoma of the cervix, bronchogenic carcinoma, and rectal carcinoma was examined by column chromatography, as were perchloric acid extracts of the various tumors. As measured by the Hansen Z-gel radioimmunoassay, the circulating antigen was heterogenous in molecular size. The CEA in the plasma of the patients with cancers of the colon, ovary, cervix, and bronchus had a molecular size of about 370,000 daltons; the perchloric acid extracts of the tumors contained CEA of a similar size. The CEA in the plasma of the rectal tumor patients and a perchloric acid extract of a rectal tumor had a molecular weight of about 200,000 daltons. The 370,000-dalton CEA was immunologically identical to the 200,000-dalton CEA when reacted with antiserum prepared against the latter. If the CEA assay is to be used as a diagnostic test, there must be an understanding of what the CEA radioimmunoassay is detecting in the plasma of patients with a variety of neoplastic and non-neoplastic diseases.

5118 COMPARATIVE STUDY OF GROUP SPECIFIC ANTIGEN OF ONCORNAVIRUSES FROM HUMAN LARYNX CARCINOMA CELLS AND ANTIGENS OF ONCORNAVIRUSES OF DIFFERENT ORIGIN.

(Rus.) Il'in, K. V. (N. F. Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR), I. S. Irlin, A. F. Bykovskii, Zh. Zh. Spure, G. G. Miller and V. M. Zhdanov. *Vopr Virusol* (1):57-60, 1974.

Oncornavirus antigen of Hep-2 cells was studied in a precipitation reaction in 1% agar. The precipitate was centifuged in 20-60% sucrose-density gradients and the 1.15-1.18 g/ml fractions were diluted with 0.1 M phosphate buffer solution. Half of the antigen was injected in combination with Freund adjuvant (1:1) into the popliteal lymph nodes (p.l.n.) of rabbit; the other half was injected i.v., s.c. and p.l.n. one month later without the adjuvant. Antiserum was absorbed by human embryo cells and diluted in medium 199 with 10% lactalbumin hydrolysate and lyophilized bovine serum. Two types of virus antigen were prepared: antigen I was purified in sucrose-density gradients twice and treated with ether for 15 min. two times. Antigen II was prepared by freezing and defreezing of HEp-2 cell suspension four times. The HEp-2 virus antigens were tested against B virus from human cell lines: HeLa, DAPT, RH and Detroit-6, also C virus from H-22. The antiserum was compared with the test-system for the mammary gland cancer virus in mice. The test-system revealed that the HEp-2 oncornavirus antigen may be group-specific for B viruses present in the human cell cultures studied in the experiment. An identical antigen was found in the oncornavirus isolated from the spontaneous mammary carcinoma of the monkey but was not found on the oncornavirus of mammary gland cancer in mice.

5119 COMPLEMENT RECEPTORS ON CELL MEMBRANE. II. SEPARATION FROM MOUSE PLASMA OF TWO ESSENTIAL FACTORS FOR COMPLEMENT RECEPTORS ON CELL MEMBRANES. *(E.)* Okada, H. (Natl. Cancer Cent. Res. Inst., Tokyo, Japan) and N. Okada. *Jpn J Exp Med* 44 (4):301-310, 1974.

DEAE cellulose chromatography was used to separate mouse C3(C3^m) (the complement factor responsible for making EZ(IgM)C42 reactive to human erythrocytes but not to a cultured Daudi cell line derived from Burkitt's lymphoma) and an additional factor (Af) from DDN mouse EDTA-plasma. C3^m reacted on EA(IgM)C42 and generated EA(IgM)C423^m which adheres to human erythrocytes (immune adherence receptor, H-receptor). Af reacted on EA(IgM)C423^m and not on EA(IgM)C42. The reaction of Af diminished adherent reactivity to H-receptor (H-activity) and generated adherent reactivity (D-activity) to Daudi cells (D-receptor). Af reacted with EA(IgM)C423^m, but generated D-activity less efficiently than the reaction with EA(IgM)C423^m. In the guinea pig complement system, Af may correspond to the C3 inactivator or C5 site generation inhibitor. However, neither of these generated D-activity on EA(IgM)C423^m. Thirteen percent of mouse peripheral leukocytes bear the H-receptor, 9% bear the D-receptor, and 8% bear both receptors. These ratios changed significantly following the *in vivo* injection of bacterial lipopolysaccharides, suggesting some as yet undefined role of these two complement receptors *in vivo*.

5120 SEQUESTRATION OF MACROPHAGES IN GROWING TUMOURS AND ITS EFFECT ON THE IMMUNOLOGICAL CAPACITY OF THE HOST. *(E.)* Eccles, S. A. (Chester Beatty Res. Inst., Sutton, England) and P. Alexander. *Br J Cancer* 30(1):42-49, 1974.

A study was made of the effects of various macrophage rat tumors on a syngeneic host's ability to produce an inflammatory response to i.p. oyster glycogen, or a cutaneous delayed hypersensitivity (DHS) response to PPD or SRBC antigens after appropriate sensitivity. Tumors of 8% and 55% macrophage content, designated MC-3 and HSBPA resp., were used. Inflammatory exudates were induced by 4 mg oyster glycogen/10 ml sterile saline i.p. at various times during tumor growth. Monocytes and macrophage determinations were made four days later. DHS was measured by the increase in foot thickness after intradermal injection of antigen. SRBC and B.C.G. antigens were used, with the eliciting antigen PPD used in B.C.G.-immunized animals. The number of monocytes entering the peritoneal cavity decreased with tumor growth. The HSBPA tumor showed a more rapid decrease in monocytes than the MC-3 tumor. Macrophage counts in unstimulated cavities showed no significant change with the presence of a tumor. Tumor growth suppressed DHS expression, with HSBPA tumors ablating more rapidly. DHS expression to the sensitizing antigen was regained within seven days after surgical removal of the tumor. No lymphocytic defect was seen throughout the experiment. The reversal of DHS abrogation was noted upon injection of peritoneal exudates obtained from oyster glycogen stimulation. Additional DHS testing of nine different tumors (all 15-20 g) showed a direct correlation between macrophage content and suppression of normal DHS. The data show that primary and transplanted sarcomata attract large numbers of monocytes causing a defect of cutaneous DHS. The degree of DHS impairment was found to be determined by macrophage content and not tumor size or time in host. It is suggested that many failures of specific immunological recognition or reactivity may be due to inavailability of monocytes needed to fulfill the expression of these phenomena.

5121 AN INHIBITOR OF CELL PROLIFERATION RELEASED BY CULTURES OF MACROPHAGES. *(E.)* Calderon, J. (Harvard Med. Sch., Boston, Mass.), R. T. Williams and E. R. Unanue. *Proc Natl Acad Sci USA* 71(11):4273-4277, 1974.

Peritoneal exudate cells from normal C57Bl/6J mice, mice injected i.p. 3 days previously with 1.5 ml of 10% proteose-peptone, or mice injected i.p. 7 days previously with *Listeria monocytogenes* were established in cell culture. The capacity of the peritoneal exudate cell culture fluids to influence the incorporation of [^{3}H] thymidine by EL-4 leukemia cells, spleen lymphocytes stimulated by mitogens, 3T3 fibroblasts, and polyoma-transformed 3T3 fibroblasts was studied. The peritoneal exudate cell culture fluids consistently inhibited the proliferation and growth of the various cell types. EL-4 cells were incubated for 7-8 hours in various dilutions of peritoneal exudate cell fluid, washed, and incubated in normal medium. [^{3}H] thymidine incorporation was inhibited during incubation in peritoneal exudate cell fluid, but was regained after culture in normal medium. The inhibitory activity of peritoneal exudate cells treated with anti-θ serum (which kills thymicderived lymphocytes) was the same as that of untreated peritoneal exudate cells, indicating that T cells play no role in the inhibitory activity of the peritoneal exudate cell fluid. Peritoneal exudate cell culture fluids had a greater inhibitory effect on the growth of EL-4 cells than did the fluids of spleen which adhere to the culture dishes; the latter had a greater inhibitory effect than the fluids of normal spleen cells, which had a greater inhibitory effect than the fluids of spleen cells deprived of macrophages. Thus, inhibitory activity is a property of cells adhering to dishes; the inhibitory activity is ascribed to mature macrophages. The supernatant fluids from peritoneal exudate cells of normal, peptone-injected, and *Listeria*-infected mice inhibited [^{3}H] thymidine incorporation into EL-4 cells to the same extent. The inhibitory activity of peritoneal exudate cell fluids on EL-4 cells was lost by dialysis, was resistant to tryptic digestion, and was stable to freezing and thawing. A significant percent of the inhibitory activity on EL-4 cells was lost by incubation of the peri-

oneal exudate cell fluids with EL-4 cells. The
osorption of the peritoneal exudate cell fluid
ctivity was weak at 37 C. The inhibitor present
n peritoneal exudate cell fluids may contribute
o the deleterious effects found when various cells,
ncluding neoplastic ones, are cultured in the pre-
ence of macrophages.

122 IMMUNOLOGICAL CELL MARKERS ON LYMPHOBLASTS OF PATIENTS WITH ACUTE LYMPHATIC LEUKEMIA.
E.) Schwenk, H. U. (Univ. Children's Hosp. Erlan-
en-Nürnberg, West Germany). *Z Kinderheilkd* 118:
7-95, 1974.

ne blast cells of eight patients with acute lym-
hatic leukemia were investigated for B- and T-cell
arkers at the time of diagnosis. None of the
lasts were positive for membrane-fluorescence.
lasts of a 6.5 yr old boy showed T-cell properties
t the time of diagnosis; the patient relapsed four
onths after diagnosis and again blasts in the
lood, bone marrow, and cerebrospinal fluid showed
-cell properties. A 13 yr old boy underwent sur-
ery and radiotherapy for lymphosarcoma in the
ight inguinal area; a few months after termination
f chemotherapy, blasts were found in the spinal
luid. On subsequent bone marrow puncture in both
ompartments the blasts had no B- or T-cell proper-
ies. The blasts could not be separated from re-
aining lymphocytes in the blood by gradient cen-
rifugation, but the remaining lymphocytes were
redominantly B lymphocytes. Analysis of lympho-
yte subpopulations is important in neoplastic
isease to learn more about the immune reactions
f organisms to malignancy.

23 T-LYMPHOCYTE RESPONSES IN PATIENTS WITH MALIGNANT MELANOMA. *(E.)* Butterworth, C.
Vestminster Hosp., London, England), C. J. Oon, G.
estbury and J. R. Hobbs. *Eur J Cancer* 10(10):639-
6, 1974.

mphocyte transformation to phytohemagglutinin (PHA),
llogeneic lymphocytes (MLR), and purified protein
erivative (PPD) were studied in 71 patients (30 men
d 41 women with a mean age of 51 yr) with malignant
elanoma. Response to PHA occurred in 69/71 patients;
o patients with advanced stage III malignant melan-
a did not respond and died within one week. *In vi-*
o PPD responses occurred in 42/71 patients at the
me time as their PHA and MLR responses; response
s normal in 86% of the patients while seven pa-
ents who did not have a normal PPD response had a
rmal MLR response. The MLR response was subnormal
31/71 patients (44%); subnormal responses were ob-
ined in 50% of the patients with lower limb lesions,
% with upper limb lesions, 50% with lesions of the
unk, and 25% with lesions of the head and neck. A
bnormal MLR response was present in 11/14 men com-
red to 5/17 women in both autologous and ABO-com-
tible sera, indicating an intrinsic lymphocyte de-
ect. Serum of 17% of the men and 27% of the women
ntained factors which inhibited the allogeneic lym-
ocyte response of a normal control by greater than
% in autologous control serum. It is suggested
at MLR is the best available test to monitor the
recognition capabilities of a subject for immune capabilities to foreign tissue antigens.

5124 LYMPHOCYTE FUNCTION IN BREAST CANCER. *(E.)* Roberts, M. M. (R. Infirm, Edinburgh, Scotland). *Eur Surg Res* 6(1):11-17, 1974.

Breast tumors may be influenced by circulating lymphocytes leading to an immune response. To assay such prognosis, reactions of both malignant and benign cancer lymphocytes and their relationship to circulating immune response at tumor sites were determined. Biopsies were obtained from cancer patients who had undergone mastectomy, and an extract was prepared and tested. Local lymphocytic reactions in malignant cells were confirmed by histopathology. *In vitro* and *in vivo* T-cell tests were performed with 41 malignant and 15 benign conditions. Results showed that 26 patients with malignant tumors (63%) and three with benign tumors (26%) reacted to their own tumors. As to the 25 pateints tested for leukocyte migration, similar results were observed. The degree of lymphocyte infiltration of the tumor by skin-tested individuals, showed no significant differences in the percentage of positive reactions. In other series of tests, immunoglobulin levels were much higher with malignant tumors. The presence of plasma cells also increased IgM levels. Similarly, serum-precipitating antibodies gave increased levels among patients with malignant rather than with benign tumors or the controls. Correlation between circulating immune response and the degree of lymphocyte infiltration of breast cancer cells could not be made.

5125 CYTOTOXICITY OF HUMAN ROSETTE-FORMING BLOOD LYMPHOCYTES ON CULTIVATED HUMAN TUMOR CELLS. *(E.)* Wybran, J. (Dep. Med., Univ. California, San Francisco), I. Hellstrom, K. E. Hellstrom and H. H. Fudenberg. *Int J Cancer* 13(4):515-521, 1974.

Human peripheral blood lymphocytes from seven cancer patients (five melanoma, one kidney carcinoma, and one sarcoma) were separated by Ficoll-Hypaque procedures into two fractions, one rich in T-cells, another poor, as determined by ability to form rosettes with sheep erythrocytes. When tested for cytotoxicity on plate-cultured tumor cells of the same histological type as that of tumors of the respective lymphocyte donors, the T-cell rich fraction had a higher activity than did the T-cell poor fraction. The results suggest an important role of human T-cells in the *in vitro* killing of tumor cells, especially in view of a previous observation that cancer patients show defective rosette-formation for their blood lymphocytes.

5126 STIMULATION OF MITOGENESIS IN NORMAL AND LEUKEMIC HUMAN LYMPHOCYTES BY DIVALENT AND TETRAVALENT LIMA BEAN LECTINS. *(E.)* Ruddon, R. W. (U. Michigan Med. Sch., Ann Arbor), L. M. Weisenthal, D. E. Lundeen, W. Bessler and I. J. Goldstein. *Proc Natl Acad Sci USA* 71(5):1848-1851, 1974.

Lima bean lectin specifically binds blood-group A substance, this binding being inhibited by N-acetyl-

D-galactosamine. Two active components (II and III) with molecular weight of 247,000 and 124,000, resp. have been identified. Both are composed of identical 31,000-molecular-wt glycoproteins linked by an interchain disulfide bond to form 62,000-molecular-wt subunits. Cultures were prepared from lymphocytes obtained from six normal subjects and four patients with chronic lymphocytic leukemia (CLL). Both lima bean lectins showed mitogenic activity when added to the normal and leukemic lymphocyte cultures. Component II, a tetramer with four saccharide binding sites, was more active than component III, a dimer with two binding sites/molecule, as a mitogen for the normal lyphocytes. Component II also stimulated mitogenesis in populations of leukemic lymphocytes and appeared to have greater activity than phytohemagglutinin-P in leukemic lymphocyte cultures from some patients. Component III had minimal mitogenic activity toward the leukemic lymphocytes. Components II and III appear to compete for the same cell-surface binding sites, although component II showed a much greater capacity than component III in triggering DNA synthesis at low concentrations (2.5-25 μg/ml) in normal lymphocyte cultures. These results suggest that the mitogenic activity of the lima bean lectin components is directly related to their valence.

5127 COLONY-STIMULATING FACTORS IN CULTURES OF HUMAN PERIPHERAL BLOOD CELLS.

(E.) Prival, J. T. (Dep. Mol. Biol., Litton Bionetics Inc., Bethesda, Md.), M. Paran, R. C. Gallo and A. M. Wu. *J Natl Cancer Inst* 53(6):1583-1588, 1974.

Conditioned media containing colony-stimulating factors (CSF) were prepared in culture from unfractionated leukocytes and a lymphocyte-rich fraction of human peripheral blood. The leukocyte-conditioned media stimulated growth in human and mouse hematopoietic colonies, but the conditioned media prepared from the lymphocyte-rich fraction had considerably greater activity in the human system than in the mouse system. Leukemic cells from patients not in the acute stage of the disease showed the same preference for lymphocyte-conditioned media as did normal cells. CSF activity was increased more than two-fold when relatively low concentrations of lymphocytes (10^6 cells) were treated with phytohemagglutinin (PHA) in the presence of 1% human plasma; mouse marrow cells grew poorly on conditioned medium prepared from PHA-stimulated lymphocytes and not at all on medium from unstimulated lymphocytes. The addition of lymphocytes to unfractionated leukocytes increased the CSF activity in the conditioned medium, the increase being proportional to the total number of lymphocytes. When plated without leukocytes, more lymphocytes were required to produce active conditioned medium. CSF activity in conditioned medium prepared by supplementation of irradiated (killed) leukocytes with lymphocytes was similar to that obtained with lymphocytes alone, indicating that a simple increase in the cell mass of the culture did not stabilize low numbers of lymphocytes. Unlike human marrow cells, mouse cells were not stimulated by the addition of lymphocytes to irradiated leukocytes. There were neither inhibitors nor enhancers present in the conditioned media prepared from the unfractionated leukocytes and the lymphocyte-rich fraction. The results indicate that there are at least two types of CSF with regard to species specificity, that the lymphocyte-rich fraction contained CSF producing-cells, and that the factor(s) which were relatively specific for human cells could be separated from less specific factors.

5128 BIOCHEMICAL AND MORPHOLOGICAL OBSERVATIONS ON LYMPHOCYTES IN CONTINUOUS CELL CULTURE FROM A PATIENT WITH CHRONIC LYMPHOCYTIC LEUKEMIA.

(E.) Sawitsky, B. (Long Island Jewish-Hillside Med. Cent., New Hyde Park, N.Y.), S. D. Douglas, R. Lipton and A. Sawitsky. *Acta Haematol (Basel)* 52(2):83-94, 1974.

A continuous cell culture was established from unstimulated peripheral blood lymphocytes of a 46-yr-old man with chronic lymphocytic leukemia. The lymphocytes were obtained at a time when the patient had a vesicular herpetic eruption of the face and neck and a lymphocyte count of $200,000/mm^3$. The cells grew singly and in free-floating aggregates; the population was mixed and contained lymphoid, plasmacytoid, reticulum cells, and blast cells. Histocompatibility antigen typing of the established cell line was identical to pre-culture cells, and remained unaltered. Although there was no rise in herpes antibody titer, electron microscopy demonstrated herpes-like virus particles. Aneuploidy was present, but the predominant chromosomal mode was 46, male. Glycolytic enzyme patterns showed predominance of the enzymes utilized in the anaerobic pathway. The cell generation time was 30-50 hr. The relative ease with which this patient responded to therapy by complete clinical as well as bone marrow remission (at the time his peripheral blood cells were established into long-term culture) indicates that no prognostic value can be assigned to the event.

5129 CYTOXICITY OF LYMPHOCYTES FROM PATIENTS WITH CANCER OF THE URINARY BLADDER: DETECTION BY A ^{3}H-PROLINE MICROCYTOTOXICITY TEST.

(E.) Bean, M. A. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.), H. Pees, J. E. Fogh, H. Grabstald and H. F. Oettgen. *Int J Cancer* 14(2):186-197, 1974.

Human lymphocytes (purified from defibrinated venous blood using gelatin sedimentation, nylon column incubation, and Tris NH$_4$Cl lysis of contaminating erythrocytes) were tested for cytotoxicity against T24 cells derived from a carcinoma of the bladder and against cell cultures derived from other tissues. Cytotoxicity was assessed in a modified microcytotoxicity test where loss of ^{3}H-proline prelabeled monolayer target cells from the surface of microwells indicated destruction of these cells. The number of target cells that remained attached after incubation with lymphocytes (measured as residual ^{3}H-counts) was compared to the number that remained attached after incubation with control lymphocytes. Specific cytotoxicity for T24 cells was seen more often with lymphocytes from bladder cancer patients (10/27) than from other patients or normal individuals (2/49), which suggests that this is a disease-related phenomenon. By contrast, non-specific cytotoxicity occurred with equal frequency among bladder patients (6/27) and other patients (9/36) although less frequently among normal individuals (0/13). In addition, lymphocytes that showed specific cytotoxicity for T24 cells were found more often in patients with early or superficial bladder cancer (8/15) and less often in patients with advanced bladder cancer (2/12). These results are in agreement with those obtained previously using the standard microcytotoxicity test to measure target-cell destruction and influence on target-cell proliferation.

5130 SELECTIVE ACTIVATION OF HUMAN B-LYMPHOCYTES BY SUBOPTIMAL DOSES OF POKEWEED MITOGEN (PWM): QUANTITATION AND ULTRASTRUCTURE OF THE STIMULATED CELLS. *(E.)* Biberfeld, P. (Karolinska Hosp., Stockholm, Sweden) and H. Mellstedt. *Exp Cell Res* 89(2):377-388, 1974.

Quantitation and ultrastructural studies were conducted concerning the differential effect of various doses of pokeweed mitogen (PWM) on B- and T-cell triggering. Passage of lymphocytes through the IgG-anti-IgG coated column effectively removed lymphocytes with B-cell characteristics and increased the proportion of T-lymphocytes. The DNA synthesis induced by PWM in the B-cell depleted preparation was much lower than in the unfractionated cell preparation at PWM concentrations of 1 and 10 µg. At 100 µg/ml, the difference in thymidine uptake was less significant but still usually lower in the B-cell depleted cultures. PWM induced transformation of the lymphocytes which were classified into three morphological types; nuclear thymidine incorporation was observed in all types at all time intervals studied. The rate of lymphocyte transformation was dose and time dependent; 100 µg/ml resulted in almost 100% transformation after five days incubation. The present data support observations that PWM is a mitogen for both T- and B-cells, and also suggest a difference in the triggering threshold of the B- and T-lymphocytes for PWM.

5131 LYMPHOSARCOMA CELL GROWTH IS SELECTIVELY INHIBITED BY B LYMPHOCYTE MITOGENS: LPS, DEXTRAN SULFATE AND PPD. *(E.)* Ralph, P. (Salk Inst. Biol. Stud., San Diego, Calif.), I. Nakoinz and W. C. Raschke. *Biochem Biophys Res Commun* 61(4):1268-1275, 1974.

A series of murine lymphosarcomas, including several induced by the Abelson leukemia virus, were adapted to tissue culture and the effect of several B lymphocyte mitogens on their growth studied. All of the mitogens tested: bacterial lipopolysaccharides (LPS), polyanion dextran sulfate, purified protein derivative from Bacillus Calmette-Guerin strain of *Mycobacterium bovis* (PPD), and a protein preparation from the bacillus (BCG), inhibited the growth of at least one of the lymphosarcomas tested. The cell lines were grouped according to their patterns of sensitivity to dextran sulfate (Class I), dextran sulfate and LPS (CLass IIA), LPS (Class IIB), and LPS and PPD (Class III). These different patterns of sensitivity to the various mitogens suggest that the cell-lines described represent lymphosarcomas arising from normal lymphocytes at different stages of maturation and that they retain the pattern of mitogen interactions characteristic of the stage from which they arise. Thus, the Class I lines arise from stem cell lymphocytes, the Class II lines arise from early lymphocytes, and the Class III lines arise from late lymphocytes. None of the mitogens tested affected the growth of other hematopoietic cell lines: myelomas, T lymphomas, mastocytoma, or erythroleukemia.

5132 INTERCELLULAR INFORMATION TRANSFER IN IMMUNOGENESIS. III. SUCCESSIVE FRACTIONATION OF SPLEEN NUCLEAR RNA OF IMMUNIZED RATS AND THE BIOLOGICAL ACTIVITY OF DIFFERENT FRACTIONS. *(Rus.)* Aksenova, N. N. (Inst. Cytol., Leningrad, USSR), L. A. Sleptsova, T. N. Tsikarishvilli, V. Ia. Fel, M. L. Figelman and Iu. M. Olenov. *Tsitologiia* 16(7):886-892, 1974.

5133 MICROASSAY FOR THE SEROLOGICAL DETECTION OF TUMOR CELL ANTIBODIES: PRELIMINARY RESULTS WITH A CHEMICALLY INDUCED MURINE SARCOMA AND HUMAN TUMOR CELL CULTURES. *(Ger.)* Fritze, D. (U. California, Los Angeles), D. H. Kern and G. H. Pilch. *Verh Dtsch Ges Inn Med* 80:1661-1662, 1974.

5134 ISOLATION OF TUMOR LOCALIZING ANTIBODIES WITH IMMUNOSORBENTS. IV. MODEL STUDY ON LABELING RABBIT GAMMA GLOBULIN AND ANTIBODIES FOR HORSE SERUM ALBUMIN WITH ^{131}I. *(Ger.)* Teichmann, B. (Cent. Inst. Cancer Res., Berlin-Buch, E. Germany) R. Vogt and H. E. Schmidt. *Arch Geschwulstforsch* 44(4):319-327, 1974.

5135 METHODOLOGY FOR DETERMINING AGGLUTINATION AND AGGLUTINATION INHIBITION OF TUMOR AND THYMUS CELLS USING THE TuR ZG 2 PARTICLE COUNTER. *(Ger.)* Gutsche, W. (Cent. Inst. Microbiol. Exp. Ther., Jena, E. Germany). *Arch Geschwulstforsch* 44(3):235-245, 1974.

5136 LOCALIZATION OF LABELED ANTI-CEA ANTIBODIES IN NUDE MICE BEARING HETEROGRAFT OF HUMAN COLON CARCINOMA. *(E.)* Mach, J. P. (Ludwig Cancer Res. Inst., Lausanne, Switzerland), S. Carrel, C. Merenda, R. Fritsche, B. Sordat and J. C. Cerottini. *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:16, 1973.

5137 CYTOTOXICITY WITH ANTIBODY-GLUCOSE OXIDASE CONJUGATES SPECIFIC FOR A HUMAN COLONIC CANCER AND CARCINOEMBRYONIC ANTIGEN. *(E.)* Shearer, W. T. (Washington Univ. Sch. Med., St. Louis, Mo.), T. R. Turnbaugh, W. E. Coleman, R. D. Aach, G. W. Philpott and C. W. Parker. *Int J Cancer* 14(4):539-547, 1974.

5138 EPSTEIN-BARR VIRUS CAPSID ANTIGEN (EB-VCA) AND IgG ANTIBODY TITERS IN SPLENECTOMIZED PATIENTS WITH HODGKIN'S DISEASE. A FOLLOW-UP. *(Ger.)* Gunzer, U. (Med. Clin., U. Wurzburg, Germany) and R. Nurnberger. *Verh Dtsch Ges Inn Med* 80:1619-1623, 1974.

5139 IMMUNOCHEMICAL PROPERTIES OF SOLUBLE IMMUNE COMPLEX FROM THE SERUM OF CANCER PATIENTS. *(Ukr.)* Kolesnikova, I. M. (A. V. Palladin Inst. Biochem., Kiev, USSR), E. G. Kostrezhevskaia and E. I. Polianskaia. *Ukr Biokhim Zh* 46(4):447-450, 1974.

5140 THE LIPIDS OF MYELOMA PROTEINS. LIPIDS ASSOCIATED WITH NORMAL AND MYELOMA IgA. *(Fr.)* Goulley, Y. (Teaching Res. Unit Med. Sci., Toulouse, France), M. L. Solera and P. Valdiguie. *Pathol Biol (Paris)* 22(7):567-574, 1974.

5141 TWO MYELOMA IgA SUBCLASSES IN HUMAN SERUM. COMPARATIVE IMMUNOELECTROPHORETIC STUDY. *(E.)* Chisiu, N. S. (Cantacuzino Hosp., Bucharest, Rumania). *Rev Roum Biochim* 11(4):229-231, 1974.

5142 IMMUNOLOGICAL SIGNIFICANCE OF α_2-MACROGLOBULIN DETECTED IN TUMOR TISSUE AND CULTURED TUMOR CELLS. *(E.)* Dalbow, M. H. (Allegheny Gen. Hosp., Pittsburgh, Pa.) and J. P. Concannon. *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:29, 1973.

5143 IMMUNOGLOBULIN E IN CHRONIC LYMPHATIC LEUKEMIA, MULTIPLE MYELOMA AND WALDENSTROM'S DISEASE. *(Ger.)* Schwarz, S. (Med. Clin., Univ. Innsbruck, Austria), F. Gabl, D. Pastner, H. Huber and H. Braunsteiner. *Z Immunitaetsforsch* 148(3):196-207, 1974.

5144 IMMUNOLOGICAL RESPONSE TO TUMOR-ASSOCIATED FETAL ANTIGENS. *(E.)* Salinas, F. A. (Biol. Div., Oak Ridge Natl. Lab., Tenn.) and M. G. Hanna, Jr. *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:20-21, 1973.

5145 A POSSIBLE GENETIC MECHANISM FOR CONTROLLING A FETAL LEUKEMIA ANTIGEN IN AMV-INDUCED LEUKEMIC CHICKENS. *(E.)* Sanders, B. G. (Dep. Zool., Univ. Texas Austin), R. L. Teplitz, A. M. Brodetsky and H. Fung. *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:24, 1973.

5146 ANTIGEN SPECIFICITY AND IMMUNOGENIC CAPACITY OF 3M KCl CELL EXTRACTS FROM ASCITES TUMOUR ATPC+. *(E.)* Marconi, P. (Microbiol. Inst. Med. Fac., Univ. Perugia, Italy), F. Bistoni and M. Pitzurra. *Boll Ist Sieroter Milan* 53(2):377-391, 1974.

5147 IMMUNOLOGICAL SIMILARITIES BETWEEN FETAL ANTIGENS AND METHYLCHOLANTHRENE-INDUCED TUMOR CELL ANTIGENS. *(E.)* Wells, S. A. Jr., (Duke Univ. Med. Cent., Durham, N. C.) and J. P. Grant. *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:21, 1973.

5148 IMMUNOBIOASSAY FOR HUMAN TUMOR-ASSOCIATED FETAL ANTIGENS. *(E.)* Granatek, C. H. (M. D. Anderson Hsop. Tumor Inst., Houston, Tex.), M. G. Hanna, Jr., E. M. Hersh, J. U. Gutterman and G. M. Mavligit. *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:21-22, 1973.

5149 IDENTITY OF VARIOUS PHYSICOCHEMICAL CHARACTERISTICS OF HUMAN AND MURINE ONCOFETAL ANTIGENS. *(E.)* Stonehill, E. H. (Sloan-Kettering Inst., New York, N. Y.). *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:20, 1973.

5150 ISOLATION OF A HUMAN FETAL GLYCOPROTEIN CROSS-REACTING WITH MALIGNANT NEOPLASMS. *(E.)* Fierer, J. A. (Columbia Univ. Coll. Physicians Surg., New York, N. Y.), M. Weiss, J. V. Klavins, R. Mesa-Tejada and J. I. Berkman. *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 2-7, 1973* 3:18, 1973.

5151 THE IMMUNOSPECIFICITY OF CHROMATIN NONHISTONE PROTEIN-DNA COMPLEXES IN NORMAL AND NEOPLASTIC GROWTH. *(E.)* Chiu, J. F. (M. D. Anderson Hosp. Tumor Inst., Houston, Tex.), K. Wakabayashi, W. Brade and L. S. Hnilica. *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:25-26, 1973.

5152 EMBRYONIC ANTIGENS ASSOCIATED WITH CHEMICALLY INDUCED COLON CARCINOMAS IN RATS. *(E.)* Steele, G., Jr., (Wallenberg Lab. Dep. Med. Microbiol., Univ. Lund, Sweden) and H. O. Sjogren. *Int J Cancer* 14(4):435-444, 1974.

5153 LOCATION OF A CARCINOFETAL ANTIGEN ON THE CELL MEMBRANE IN INTESTINAL CARCINOMAS INDUCED BY CHEMICALS IN THE RAT. *(Fr.)* Martin, F. (Fac. Med., Dijon, France). M. S. Martin, S. Knobel and M. Bordes. *Biol Gastroenterol (Paris)* 7(4): 306, 1974.

5154 THE PURIFICATION, CHARACTERIZATION AND MEASUREMENT OF α_1-FETOPROTEIN IN THE RAT. *(Fr.)* Belanger, L. (Dept. Biochem., Laval Univ., Quebec, Canada) and D. Dufour. *Vie Med Can Fr* 3(4):383-407, 1974.

5155 HL-A ANTIGENS AND PREDISPOSITION TO CERTAIN ILLNESSES. *(Fr.)* Hors, J. (St. Louis Hosp., Paris, France), M. Schmid, J. Gony, M. Saglier and J. Dausset. *C R Soc Biol (Paris)* 168(2/3):173-180, 1974.

5156 STUDY OF AN ABNORMAL PROTEIN IN PRIMARY BRONCHIAL CARCINOMA. *(Fr.)* Kleisbauer, J. P. (Fac. Med. Pharm., U. Aix-Marseille II, France), R. Poirier, L. Nosny and B. Michel. *Marseille Med* 111(11):547-550, 1974.

5157 TUMOR-SPECIFIC ANTIGENS IN BRONCHIAL CARCINOMA. 2. QUANTITATIVE DETERMINATION OF FLUORESCENCE INTENSITY IN HISTOLOGICAL SECTIONS. *(Ger.)* Schlipkoter, H. W. (Inst. Hyg., Univ. Dusseldorf, W. Germany) P. Feyerabend, K. Koenen and H. Idel. *Zentralbl Bakteriol Hyg [Orig B]* 159(5/6): 526-238, 1974.

5158 AUSTRALIA ANTIGEN IN SERA FROM SUBJECTS WITH TUMORS. *(It.)* Ioli, A. (Hyg. Inst., Univ. Messina, Italy) E. Giachino and F. Cananzi. *Boll Ist Sieroter Milan* 53(1):48-51, 1974.

5159 MURINE TERATOCARCINOMA: STUDY OF SURFACE ANTIGENS FROM PLURIPOTENTIAL CELLS. *(Fr.)* Dexter, D. L. (Dep. Cell Genetics, Coll. France, Paris), M. H. Buc-Caron, H. Jakob, J. F. Nicolas and G. Gachelin. *Ann Microbiol [B] (Paris)* 125(3):347-356, 1974.

5160 ANTIGENICITY OF NORMAL AND TUMORAL GLYCOPROTEINS CORRELATED WITH THEIR ACTION ON SERUM GLYCOPROTEINS. *(E.)* Rusanescu, T. (No affiliation), A. Curigut and R. Murgoci. *Rev Roum Physiol* 11(1):69-77, 1974.

5161 SENSITIZATION RATES WITH HAPTENES IN TUMOR PATIENTS. *(Ger.)* Remy, W. (Dermatol. Clin., Free Univ., Berlin, Germany), B. Russman and G. Stuttgen. *Med Welt* 25(43):1749-1452, 1974.

5162 ACTIVATED T-LYMPHOCYTES: A PHYSIOLOGICAL METHOD FOR DEFENSE AGAINST TUMORS. *(Ger.)* Rollinghoff, M. (Walter Eliza Hall Inst., Melbourne, Australia) and H. Wagner. *Verh Dtsch Ges Inn Med* 80:1584-1586, 1974.

5163 DETECTION OF CYTOTOXIC T LYMPHOCYTES IN THE EL4 MOUSE LEUKEMIA SYSTEM: INCREASED ACTIVITY OF IMMUNE SPLEEN AND PERITONEAL CELLS FOLLOWING PREINCUBATION AND CELL FRACTIONATION PROCEDURES. *(E.)* Vasudevan, D. M. (Swiss Inst. Exp. Cancer Res., Lausanne), K. T. Brunner and J. C. Cerottini. *Int J Cancer* 14(3):301-313, 1974.

5164 CYTOTOXICITY OF NON-T VERSUS T-LYMPHOCYTES FROM MELANOMA PATIENTS AND HEALTHY DONORS ON SHORT- AND LONG-TERM CULTURED MELANOMA CELLS. *(E.)* de Vries, J. E. (Netherlands Cancer Inst., Amsterdam), S. Cornain and P. Rumke. *Int J Cancer* 14(4):427-434, 1974.

5165 T AND B MEMBRANE MARKERS ON BLAST CELLS IN 69 PATIENTS WITH ACUTE LYMPHOBLASTIC LEUKEMIA. *(E.)* Brouet, J. C. (INSERM, Saint-Louis Hosp., Paris, France), H. R. Toben, A. Chevalier and M. Seligmann. *Ann Immunol (Paris)* 125(5):691-696, 1974.

5166 SPECIFIC AND NON-SPECIFIC IMMUNOLOGIC REACTIVITY OF REGIONAL LYMPH-NODE LYMPHOCYTES IN HUMAN MALIGNANCY. *(E.)* Ambus, U. (M. D. Anderson Hosp. Tumor Inst. Houston, Tex.), G. M. Mavligit, J. U. Gutterman, C. M. McBride and E. M. Hersh. *Int J Cancer* 14(3):291-300, 1974.

5167 PATTERNS OF ANTIGENIC CROSS-REACTIVITY IN HUMAN CANCER CELLS, DETECTABLE BY STUDYING LYMPHOCYTE-MEDIATED TUMOUR CELL CYTOTOXICITY. *(E.)* Hellstrom, I. (Univ. Washington Med. Sch., Seattle) and K. E. Hellstrom. *Conf Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:3, 1973.

5168 CELL-MEDIATED CYTOTOXICITY AGAINST HUMAN BLADDER CANCER. *(E.)* Bloom, E. T. (Univ. California, Sch. Med., Los Angeles), R. C. Ossorio and S. A. Brosman. *Int J Cancer* 14(3):326-334, 1974.

5169 CELLULAR IMMUNITY OF GLIOMA. A STUDY WITH PHASE-CONTRAST MICROCINEPHOTOGRAPHY. *(E.)* Takakura, K. (Natl. Cancer Cent., Tokyo, Japan). *Recent Prog Neurol Surg, Proc Symp Int Congr Neurol Surg, 5th, Tokyo, Oct 7-13, 1973* (Amsterdam: Excerpta Medica) pp. 133-138, 1974.

5170 *IN VITRO* TUMOR-SPECIFIC, CELLULAR-IMMUNE REACTIONS IN PATIENTS WITH HYPERNEPHROMA. *(Ger.)* Pappas, A. (1st Clin. Internal Med., U. Saarland, Homburg, Germany) G. Schwarze, K. Konig and P. G. Scheurlen. *Verh Dtsch Ges Inn Med* 80:1633-1636, 1974.

5171 ANTITUMOR IMMUNITY IN *PATIENTS* WITH CARCINOMA OF THE LARGE INTESTINE. *(E.)* Harlozinska, A. (Inst. Biostructure, Acad. Med., Wroclaw, Poland), A. Lange, A. Wozniewski, A. Kasprzak, B. Zolcynska-Kasperowicz and J. Szymanska. *Arch Immunol Ther Exp (Warsz)* 22(4):541-549, 1974.

5172 METASTASIS AND HUMORAL IMMUNITY IN CANCERS OF THE FEMALE GENITALIA. *(It.)* Manganelli, F. (2nd Clin. Obstet. Gynecol., Univ. Padua, Italy) and P. Grella. *Riv Ital Ginecol* 55(4):363-365, 1974.

5173 IMMUNOLOGICAL STUDIES OF HAMSTER TUMOR INDUCED BY ADENOVIRUSES. *(E.)* Boeva, M. (Natl. Cent. Oncol. Hematol., Sofia, Bulgaria), K. Siljanovska, I. Urumov, A. Dobreva and T. Meshkov. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:257-260, 1974.

5174 ALTERATION OF *IN VITRO* ANTI-TUMOR ACTIVITY OF TUMOR-BEARER SERA BY ABSORPTION WITH *STAPHYLOCOCCUS AUREUS*, COWAN I. *(E.)* Steele, G., Jr. (Wallenberg Lab., Univ. Lund, Sweden), J. Ankerst and H. O. Sjogren. *Int J Cancer* 14(1):83-92, 1974.

5175 CYTOSTASIS OF LYMPHOMA CELLS IN SUSPENSION: PROBABLE NON-THYMIC ORIGIN OF THE CYTOSTATIC LYMPHOID CELLS IN MICE BEARING MSV-INDUCED TUMORS. *(E.)* Senik, A. (Hosp. Cochin, Paris, France), L. de Giorgi, E. Gomard and J. P. Levy. *Int J Cancer* 14(3):396-400, 1974.

5176 IMMUNE SURVEILLANCE OF CARCINOMAS OF THE EAR, NOSE AND THROAT. *(Fr.)* Bagarry, D. (Paoli-Calmettes Inst., Marseille, France). R. Favre, J. Imbert, M. Jausseran, G. Meyer, J. Colonna d'Istria and X. Serafino. *J Fr Otorhinolaryngol* 23(10):853-855, 857-859, 1974.

5177 DISTURBANCE OF IMMUNE SURVEILLANCE IN TUMOR-BEARING HOST. *(Jpn.)* Haba, Seiji and Masayasu Kitagawa (Medical School, Osaka University). *Tampakushitsu Kakusan Koso* 19(10):930, 1974.

5178 THE USE OF ACTIVE IMMUNIZATION AS IMMUNOTHERAPY FOR A CHEMICALLY INDUCED MURINE FIBROSARCOMA. *(Ger.)* Borberg, H. (Med. Clin., U. Cologne, Germany). *Verh Dtsch Ges Inn Med* 80:1665-1668, 1974.

5179 DIFFERENCES IN THE PROTECTIVE EFFECT OF COMPLETE FREUND'S ADJUVANT IN SPONTANEOUS *VERSUS* TRANSPLANTED LYMPHOMAS IN AKR MICE. *(E.)* Check, J. H. (Hahnemann Med. Coll. Hosp., Philadelphia, Pa.), L. W. Brady and E. A. O'Neill. *Prog Exp Tumor Res* 19:217-221, 1974.

5180 IMMUNE RESPONSES OF ADENOVIRUS TYPE-9 INFECTED (TUMOR-FREE) MALE RATS AGAINST ADENOVIRUS TYPE-9 INDUCED MAMMARY FIBROADENOMAS AND A CHEMICALLY INDUCED MAMMARY CARCINOMA. *(E.)* Steele, G., Jr. (Wallenberg Lab. Dep. Med. Microbiol., Univ. Lund, Sweden), J. Ankerst and H. O. Sjogren. *Int J Cancer* 14(3):359-366, 1974.

5181 REGRESSION OF A MOUSE MAST CELL TUMOR AFTER TREATMENT WITH A VIRUS. *(Ger.)* Bandlow, G. (Hyg. Inst., U. Gottingen, Germany), B. Schlemminger and K. Bandlow. *Verh Dtsch Ges Inn Med* 80:1668-1670, 1974.

5182 MOBILITY OF CONCANAVALIN A RECEPTORS ON THE SURFACE MEMBRANE OF LYMPHOCYTES FROM NORMAL PERSONS AND PATIENTS WITH CHRONIC LYMPHOCYTIC LEUKEMIA. *(E.)* Ben-Bassat, H. (Heb. Univ.-Hadassah Med. Sch., Jerusalem, Israel), N. Goldblum, N. Manny and L. Sachs. *Int J Cancer* 14(3):367-371, 1974.

5183 AGGLUTINATION OF NORMAL AND NEOPLASTIC HUMAN CELLS BY CONCANAVALIN A AND RICINUS COMMUNIS AGGLUTININ. *(E.)* Glimelius, B. (Wallenberg Lab., Univ. Uppsala, Sweden), B. Westermark and J. Ponten. *Int J Cancer* 14(3):314-325, 1974.

5184 PERITONEAL MESOTHELIOMA ASSOCIATED WITH POLYCLONAL HYPERIMMUNOGLOBULINEMIA. *(E.)* Onodera, S. (Tohoku Univ. Sch. Med., Sendai, Japan), R. Inaba, K. Niikawa, K. Oikawa and K. Yoshinaga. *Tohoku J Exp Med* 114(3):195-203, 1974.

See also:

* (Rev): 4818, 4819, 4820, 4821, 4834, 4842, 4843, 4844, 4845, 4846, 4847, 4848, 4849, 4850, 4851
* (Chem): 4906, 4919, 4945
* (Phys): 4959
* (Viral): 4999, 5005, 5016, 5059
* (Path): 5252
* (Epid): 5287

185 THE RELATIONSHIP BETWEEN CELL VIABILITY AND CHANGES IN MITOCHONDRIAL ULTRASTRUCTURE, ELLULAR ATP, ION AND WATER CONTENT FOLLOWING INURY OF EHRLICH ASCITES TUMOR CELLS. *(E.)* Laiho, . U. (Univ. Maryland Sch. Med., Baltimore) and B. . Trump. *Virchows Arch (Zellpathol)* 15(4):267-277, 974.

study was conducted to test three hypotheses rearding the pathogenesis of cell injury: 1) Stage , characterized by cell swelling, high amplitude itochondrial swelling and mitochondrial flocculent ensities indicates irreversible cell injury; 2) tages 2 and 3, characterized by dilated endoplasic reticulum and dilated endoplasmic reticulum plus ondensed mitochondria, resp., represent pre-lethal hanges; and 3) cell death correlates inversely with ell potassium and magnesium and positively with cell odium, calcium and water. Cellular injury was prouced in Ehrlich ascites tumor cells by an inhibitor f the function of the plasma membrane (10^{-3} M parahlormercuribenzene sulfonic acid) or by inhibitors r respiration (10^{-4} M antimycin A), glycolysis (10^{-4} iodoacetic acid), oxidative phosphorylation (10^{-3} 2,4-dinitrophenol) or by combinations of the later in a medium with or without glucose. The perentages of cells stained by nigrosin or the total ercentage of dead cells (combination of nigrosin taining and the decrease of the number of cells) as correlated with mitochondrial ultrastructural hanges, ATP, Na^+, K^+, Ca^{++}, Mn^{++} and intracellular ater content in controls and treated cells. A good egative correlation was observed between total perentage of dead cells and the percentage of swollen itochondria, flocculent densities, and the Ca^{++} content of the cells. A moderate negative correlation as observed between the total percentage of the ead cells and the ATP content of the cells. It is oncluded that the good correlation between the perent of swollen mitochondria and the total number of ead cells supports the hypothesis that stage 5 represents irreversible cell injury and the similar good orrelation between condensed mitochondria and the umber of dead cells is compatible with the hypothesis that stages 2 and 3, which show condensed mitohondria, are probably prelethal stages compatible ith cell survival. The lack of a better correlation etween ATP levels and cell death may reflect the act that the length of time during which the ATP alue is low may also be of great importance.

186 ULTRASTURCTURAL STUDIES OF HALO NEVUS. *(E.)* Hashimoto, K. (Veterans Adm. Hosp., Memhis, Tenn.). *Cancer* 34(5):1653-1666, 1974.

lectron microscopic studies were performed on two esions of halo nevus developed from compound nevi o obtain more direct evidence of melanocyte disppearance. One lesion still showed an active proression of depigmentation, and the other, an old lat lesion, showed a complete loss of pigment. In he active lesion, melanocytes (or nevus cells) in he epidermis and dermis showed an enlargement of hat was interpreted as melanosome membrane leading o large cytoplasmic vacuole formation by coalesence. This indicated that the delimiting membrane f the vacuole represented swollen melanosome membrane. Many melanosomes were abnormal in that distinct cristae were not formed but were composed of irregularly shaped dense materials. Vacuolated melanocytes often contained well developed smooth and rough endoplasmic reticulum and Golgi apparatus, suggesting that these cells were actively producing melanin although their products were abnormal. These melanocytes also showed autophagocytosis of performed melanosomes in their own lysosomes. In the old depigmented lesion, melanocytes were completely absent, and numerous Langerhans' cells occupied the basal layer. The results suggest that autophagocytosis is a part of cell degeneration in primary benign halo nevus, e.g., leukoderma acquisitum centrifugum of Sutton, because many effete melanocytes in the upper epidermis showed this phenomenon. It seems most likely that such degeneration, and not transformation into L-cell, is responsible for the disappearance of melanocytes (nevus cells) and the depigmented halo formation.

5187 SCHWANN CELLS AND PERINEURIUM IN NEUROMA: SOME MORPHOLOGICAL ASPECTS. *(E.)* Lassmann, H. (Inst. Micromorphol. Wien Univ., Austria) and H. P. Ammerer. *Virchows Arch Zellpathol* 15(4): 313-321, 1974.

The structure of the perineurium of minifascicles just entering the proximal or distal stump was studied in albino rats 12 weeks after experimental transsection of the femoral nerve. The perineurium of the minifascicles started with a network of ramified cells that, under the electron microscope, had the appearance of mature perineural cells. These cells subdivided the endoneurium into numerous compartments which were separated from each other by only one cytoplasmic lamella. The formation of minifascicles resulted from splitting of the lamellas into more layers, which at least encircle their own axon group. In the transitional zone between the normal endoneurium of the stumps and the beginning of the intrafascicular perineural cells, Schwann cells also tended to encircle nerve fibers and form structures that were comparable with the so-called onion bulbs found in peripheral neuropathies. These findings suggest that the regeneration of the perineurium is initiated by proliferation of the primary perineuron cells. This is also in agreement with a previous study which found a massive proliferation of perineural cells after nerve transsection. The cells had grown into scar tissues where they finally could not be distinguished from fibroblasts. Therefore, it seems possible that perineural cells differentiate during proliferation, getting a fibroblast-like appearance, and differentiate again when recovering their primary function.

5188 CHROMOSOMAL VARIATION AND THE ORIGIN OF DRUG-RESISTANT MUTANTS IN MAMMALIAN CELL LINES. *(E.)* Terzi, M. (Imp. Cancer Res. Fund, London, England). *Proc Natl Acad Sci USA* 71(12):5027-5031, 1974.

Differences between classical stable mutants of somatic cell lines and mutants associated with chromosomal variation were determined by historically analyzing the behavior of drug-resistant mutants of the Syrian hamster line B1, a bromodeoxyuridine (BrdUrd)-resistant derivative of BHK, the Chinese hamster line DON, the mouse line 3T6H (a thioguanine-resistant mutant of 3T6) and the kangaroo-rat line PG (a thioguanine-resistant mutant of PTK1). Among the drug-resistant mutants, two classes were identified. The first was probably made up of classical mutations, e.g., alterations in the base sequence of a structural or regulatory gene. Examples of this class were the thioguanine-resistant mutants of the DON line, in which the gene product was inactive or absent, the frequency of mutation was enhanced by mutagenic treatment, reversion was rare, no karyotype alteration was demonstrable and resistance was acquired in one step over a fairly wide range of drug concentrations. The second class, which included all other mutants studied, with the possible exception of PG, was characterized by low plating efficiency, high rate of reversion and karyotypic disturbances. The frequency of mutants in the second class was not increased by treatment with nitrosoguanidine and there were no qualitative alterations in the relevant gene products, suggesting that these mutant phenotypes may be caused by a shift in phenotypic expression, itself possibly caused by variations in gene dosage.

5189 REVERSIBLE APPEARANCE OF A SPECIFIC CHROMOSOME WHICH SUPPRESSES MALIGNANCY. *(E.)* Codish, S. D. (Harvard Med. Sch., Boston, Mass.) and B. Paul. *Nature* 252(5483):610-612, 1974.

The genetic constitution of an established tumor line, a methylcholanthrene-induced fibrosarcoma (MC-42), was examined by karyotypic analysis of 122 metaphases in cells from cultures and tumor nodules. The prolonged maintenance of MC-42 fibrosarcoma cells in tissue culture had no significant effect on the modal number of chromosomes when compared with the number in serially-transplanted tumors. Chromosome banding revealed a complete complement of normal mouse chromosomes in both cultured and serially-transplanted tumor cells. The only consistent genetic alteration associated with the culturing of MC-42 cells appeared in the marker chromosome pattern characteristic of this tumor line. The eighth marker chromosome (M_8) showed specific variations between cells from tumor nodules and those from cultures. All cells from s. c. tumors contained only one M_8 chromosome; cells with two M_8 chromosomes evolved when the tumor was transferred to tissue culture. Inoculations of cloned cells having one M_8, as well as inoculations of mass cultures containing equal proportions of cells with one and two M_8, similarly produced tumors containing only cells with one M_8 chromosome. Cells with the duplicate M_8 pattern did not appear *in vivo*. Although cells with two M_8 seemed as viable as those with one M_8 *in vitro*, the capacity for tumor growth was expressed only by those which had lost the second M_8. The cytotoxic effect of sensitized lymphocytes was significantly less when target cells with two M_8 chromosomes were used. It is concluded that there is a strong association between the appearance of a second M_8 marker chromosome in MC-42 fibrosarcoma cells and the suppression of malignant characteristics. It is claimed that the MC-42 tumor line contains the only example of a suppressor chromosome which is paired with a morphologically identical chromosome that alone has no apparent direct influence on the suppression of malignancy.

5190 ORIGIN OF THE MARKER CHROMOSOMES IN AN ESTABLISHED HYPOTRIPLOID GLIOMA CELL LINE STUDIED WITH G-BAND TECHNIQUE. *(E.)* Mark, J. (Cent. Hosp., Skövde, Sweden), J. Pontén and B. Westermark. *Acta Neuropathol (Berl)* 29(3):223-228, 1974.

The chromosomes of an established human glioma cell line were studied with the Giemsa (G) banding technique. There was a flat mode at S=60-61, and around the mode there was a considerable spread involving the hyperdiploid and hypotriploid regions. A small fraction of the cells had chromosome numbers above the exact triploid one, e.g., 69, and most of these cells were found in the double stemline region. Fourteen cells with the S-numbers were karyotypes. Almost all of these had a karyotype somewhat different from that of the others. For the majority of the S-cells this multiplicity was mainly due to a variation among only a few normal chromosome pairs and some of the different marker types. As many as ten different marker types were usually incorporated in the S-karyotype. The origin of most marker chromosomes could be traced. No less than 8/10 markers were wholly or partly formed by group C and D chromosomes. The origin of the two deviating markers, mar IX and mar X could not be traced, but they seemed to have satellites and thus could be derived from D chromosomes. The findings concur with observations in 50 gliomas studied with conventional methods and also fit with the findings in a recently studied near-diploid glioma cell line. Based on these past findings and present results, a perferential pattern of variation in chromosome groups C and D is indicated.

5191 A QUANTITATIVE ULTRASTRUCTURAL STUDY OF THE PLEOMORPHIC ADENOMA (MIXED TUMOR) OF HUMAN MINOR SALIVARY GLANDS. *(E.)* Chisholm, D. M. (Univ. Illinois Med. Cent., Chicago), J. P. Waterhouse, E. Kraucunas and J. J. Sciubba. *Cancer* 34 (5):1631-1641, 1974.

A quantitative ultrastructural comparison was made of the cells of seven pleomorphic adenomas and of five normal minor salivary glands to determine the relative volumes of cells of duct, myoepithelial and acinar type in normal glands and in the tumor in these glands. Criteria were adopted for the recognition of different cell types and calibration between observers was carried out. Normal tissues examined by light microscopy showed prodominantly mucous acinar cells divided into lobules by fine connective tissue septa together with intra and interlobular ducts. Under electron microscopy, cells of duct origin were recognized as being cuboidal or irregular in shape with an oval nucleus which on occasion showed irregularity of outline. Tumor examined under light microscopy was totally or partially encapsulated and displayed characteristic duct-like patterns together with the formation of olid clumps and cords of cells. The relative volmes of cells in both normal and tumor material were btained by the stereologic method of point countng. In normal glands, duct cells occupied 2.6%, yoepithelial cells 6.2%, acinar cells 77.8%, and ther tissue elements 13.4% of tissue volume. By ontrast, in the pleomorphic adenomas, duct cells ccupied 61.5%, myopeithelial cells 4.9%, acinar ells 4.4%, and other tissue elements 29.2%. The ifferences between percentage volumes of cell types n tumor and normal gland were highly significant probability is less than 0.001). The higher proortion by volume of cells of duct origin in the leomorphic adenomas than in normal glands indicates hat these cells, rather than myoepithelial cells, re the major cells of the tumor in these glands.

192 MORPHOPHYSIOLOGICAL CHANGES IN THE ADRENAL CORTEX AND THYMUS DURING GROWTH OF A TRANSLANTABLE GLIOBLASTOMA MULTIFORME IN THE RAT BRAIN.

Rus.) Bezuglova, T. V. (Inst. Human Morphol., oscow, USSR) and N. A. Spryshkova. *Biull Eksp Biol ed* 77(10):111-114, 1974.

hanges in the structure and function of the adrenal ortex and thymus were studied in 171 infantile feale random-bred albino rats injected intracerebally ith glioblastoma multiforme (strain 101/12). Inact rats and rats with cerebral trauma served as ontrols. Although no significant changes in the eight of the adrenals or blood levels of corticoterone were detected in these three groups of rats ix days after tumor transplantation, the weight of he thymus had decreased in tumor-bearing rats and n those with cerebral trauma, indicating that some ncrease had occurred in adrenal glucocorticoid acivity. When clinical symptoms of the tumors became vident, adrenal glucorticoid activity increased sigificantly. This was manifested clearly in blood orticosterone levels, which were twice the normal alue. Histological examination of the adrenal corex of tumor-bearing rats revealed that the zona lomerulosa contained a large number of cells with acuolized cytoplasm and more sudanophilic material han in rats with cerebral trauma. Although no hanges were found in the thymus of rats with cereral trauma, the cortex in tumor-bearing rats conained large numbers of macrophages. In rats in hich the tumors did not take, many reticuloepitheial cells in the medulla of the thymus were underoing mitosis and, in six of these eight rats, ormed layers and tubular structures; the lumens of hese tubes were filled with material which gave a ositive reaction with periodic acid-Schiff (PAS) tain. PAS-positive material was also found in the ytoplasm of some reticulo-epithelial cells. These hanges in the thymus are apparently related to inreased tumor resistance.

193 CARDIAC NEOPLASIA: SIX CASES FROM AN AUTOPSY SERIES.

(E.) Halvorsen, J. F. Gade Inst., Dep. Pathol., Univ. Bergen, Norway), A. karstein and F. Hartveit. *Scand J Thorac Cardioasc Surg* 8(3):228-234, 1974.

Six cases of primary cardiac neoplasms (two previously reported) are presented. At autopsy, two were diagnosed as fibromas, and two as rhabdomyosarcomas. One case of angiomyxoma (previously diagnosed as rheumatic mitral stenosis) was discovered during corrective surgery and histologically confirmed at autopsy. One case of fibrosarcoma was diagnosed during life and confirmed by biopsy. Cardiac tumors can be produced experimentally by polyoma virus, and are usually associated with widespread lesions. Human cardiac tumor patients are usually found to have multiple lesions. Many cases of human cardiac cancer are the result of tuberous sclerosis, which is considered to be genetically transmitted. It is concluded that vertical transmission of cardiac tumors may be a possibility, and that variations in virus strength and dose, as well as host factors, may ultimately determine the histological lesion formed.

5194 ATROPHIC GASTRITIS AND ITS SEQUELAE.

(E.) Siurala, M. (Meilahti Hosp., Helsinki, Finland), J. Lehtola and T. Ihamaki. *Scand J Gasteroenterol* 9(5):441-446, 1974.

One hundred and sixteen subjects in whom atrophic gastritis had been diagnosed by biopsy between 1950 and 1954 were followed up for a mean period of 24 yr. Among these patients, nine died of gastric carcinoma by 1965, and one died of gastric cancer in 1972. Thirty-six subjects were reexamined in 1973. Gastroscopy disclosed polypoid lesions in six cases (two true adenomas, three hyperplasias, and one 'inflammatory' polyp); two additional cases had been previously diagnosed. Gastroscopy also disclosed hiatal hernia in one patient, esophageal cancer in one, and benign gastric ulcer in two cases. Multiple direct vision gastric biopsy indicated that the degree of atrophy and round cell infiltration was more severe in the body than in the antrum, and that the degree of atrophy and round cell infiltration increased with increasing distance from the pylorus. Intestinal metaplasia was fairly evenly distributed throughout the examined area. Moderate or severe epithelial atypia was present in 13 of 35 biopsied patients. Parietal cell antibodies were found in three and intrinsic factor antibodies were found in two other cases. Serum gastrin values were about 75 pM/l in 24 of the 35 cases, as compared with one out of 24 normal controls. Serum vitamin B_{12} was within normal limits in all cases. Although many patients suffered from some kind of abdominal discomfort, there was no correlation between the subjective complaints and the morphological state of the antral or body mucosa. The data do not permit the conclusion that atrophic gastritis in general is a precancerous condition.

5195 HODGKIN'S DISEASE INVOLVING WALDEYER'S LYMPHOID RING.

(E.) Todd, G. B. (St. Thomas Hosp., London, England), B. Chir and L. Michaels. *Cancer* 34(5):1769-1778, 1974.

Histories of 16 patients with Hodgkin's diesase involving parts of Waldeyer's lymphoid ring were presented. Most of the eight nasopharyngeal cases showed mixed cellularity type of change. In two of the three nasopharyngeal cases with lymphocytic predominance, the pattern became altered to one of mixed cellularity with the progress of the disease. A granulomatous type of Hodgkin's change was found in tonsilar Hodgkin's disease. The presence of similar granulomatous histologic changes in both tonsil and lymph node tissue in these cases raises the possibility of this being a distinct disease process on a different etiologic basis to other forms of Hodgkin's disease. In one of the 16 cases a nodular sclerosis histologic pattern was observed. Four of the patients had a solitary involvement of part of the ring, and in three of these the follow-up period was very short. All the rest of the patients showed involvement of Waldeyer's ring as part of more widespread Hodgkin's disease. The course of the disease process did not seem to differ from that of the general pattern of Hodgkin's disease. Involvement of Waldeyer's ring by Hodgkin's disease would thus not seem to be of any special significance in the natural history of the disease. It is possible that structural and functional differences between the nodal and extranodal lymphoid tissue of the head and neck account for the lower incidence of Hodgkin's disease in the latter, and this may have fundamental implications in the pathogenesis of the disease. A review of the literature citing this rare manifestation of Hodgkin's disease is included.

5196 GIANT MITOCHONDRIA IN ERYTHROLEUKAEMIA.

(E.) Ghadially, F. N. (Hosp. Univ. Saskatchewan, Saskatoon, Canada) and L. F. Skinnider. *J Pathol* 114(3):113-118, 1974.

A 68-year-old man who had been exposed the previous summer to lannate, was given tetracycline, ampicillin, and cephaloridine for treatment of pneumonia. Two months later, he was found to be pancytopenic, and bone marrow examination confirmed a diagnosis of erythroleukemia. The patient was treated with cyclophosphamide, cytarabine hydrochloride, and vincristine sulphate. A second bone marrow biopsy revealed persistence of the leukemic infiltrate and therapy was changed to daunorubicine, cytarabine hydrochloride, thioguanine, and prednisone. The patient died six months later. Electron microscopy, but not light microscopy, revealed the presence of giant mitochondria in the first two bone marrow biopsies, but not in a later biopsy. Virtually every macrophage section encountered contained 1-5 giant mitochondria as well as normal mitochondria and lysosomes. The normal mitochondria contained lamellar cristae, while the giant mitochondria contained tubular cristae. The giant mitochondria varied widely in shape and all contained a few matrical-dense granules. Intermediate mitochondria forms which appeared to be transitional stages in the development of giant mitochondria from normal mitochondria were also found, as were structures resembling degenerate giant mitochondria. The finding of giant mitochondria in such biopsies is a rare phenomenon about which little is known. Available evidence indicates, however, that these mitochondria probably developed as a result of drug action rather than the disease process.

5197 PH^1-NEGATIVE CHRONIC MYELOCYTIC LEUKEMIA WITH A MISSING Y CHROMOSOME.

(E.) Hossfeld, D. K. (Med. Clin., Univ. Essen, West Germany) and E. Wendehorst. *Acta Haematol (Basel)* 52(4):232-237, 1974.

The first case of a Ph^1-negative chronic myelocytic leukemia (CML) with a missing Y chromosome from bone marrow cells is described. Marrow cells from a 69-year-old male patient were studied on three occasions and phytohemagglutinin (PHA)-stimulated peripheral blood lymphocytes were studied once. The Ph^1 chromosome was absent from all metaphases studied, and the loss of the Y chromosome was substantiated by fluorescence, G banding, and C banding. The polyploid metaphases also were devoid of Y chromosomes as revealed by C banding. It is postulated that all of the bone marrow cells (erythrocytic, myelocytic, and megakaryocytic) lacked the Y chromosome. Thus, in this case, loss of the Y chromosome occurred on the stem cell level, as does the induction of the Ph^1 chromosome. The mechanism leading to the loss of the Y chromosome from bone marrow cells is, however, unclear at present.

5198 DNA CYTOPHOTOMETRY OF CHROMOSOMES IN A CASE OF CHRONIC MYELOGENOUS LEUKEMIA.

(E.) Mayall, B. H. (Biomed. Div., Lawrence Livermore Lab., Univ. California), A. V. Carrano and J. D. Rowley. *Clin Chem* 20(8):1080-1085, 1974.

Measurements of relative DNA strain content were used to study the metaphase chromosomes of a patient with chronic myelogenous leukemia (CML); techniques used included quantitative cytochemistry, scanning cytophotometry, and image-processing techniques. The measurements were normalized for each cell and expressed on a scale by which the sum of the measurements for the 44 autosomal chromosomes was 100; the normalized measurements were compared with standard values from eight normal persons. Measurement of chromosome No. 22 showed a highly significant homolog effect, the smaller chromosome always being that one that has been identified as the Philadephia chromosome. It contained significantly fewer units than the standard. Measurements of chromosome 9 also showed a highly significant homolog effect. In each cell, the larger of the pair contained significantly more units than the standard. These measurements are compatible with a balanced translocation between chromosomes 22 and 9, with no net loss of DNA. The leukemic cells also revealed an abnormality involving the other chromosome 9 and one chromosome 20. A highly significant reduction in the DNA units of chromosome 20 matched a highly significant increase in the units of chromosome 9, suggesting the presence of a second balanced translocation in these cells, again with no net loss of DNA. The 9+/20- translocation was also present in the nonleukemic blood cells of the CML patient; the 9q+/22q- translocation was present only in the leukemic cells. The methodology employed in this study is a powerful new tool of unparalleled precision for basic research into human chromosomes and into chromosome-related diseases.

199 ACUTE PROMYELOCYTIC LEUKEMIA: A MODEL FOR UNDERSTANDING THE ROLE OF THE MALIGNANT ELL IN HEMOSTASIS. *(E.)* Gralnick, H. R. (Hematol. erv., Clin. Cent., Bethesda, Md.) and H. K. Tan. *um Pathol* 5(6):661-673, 1974.

he diagnosis and treatment of intravascular coagu- ation in leukemia and acute promyelocytic leukemia ere investigated. In studies of acute promyelocy- ic leukemia, at least 50% of the bone marrow cells ere promyelocytes in all cases using Bernard's di- gnosis. Initial white blood cell counts varied rom 2000 to 300,000/mm^3 and the degree of granula- ion of individual cells differed markedly from pa- ient to patient. In some patients with acute pro- yelocytic leukemia the azurophilic granules of the romyelocytes were larger and more spindle shaped han the spherical granules of promyelocytes found n normal bone marrow or in patients with other types f leukemia. By light and electron microscopy these arger granules resembled Auer bodies of unusual size nd number. Many azurophilic and spindle shaped ranules were also found in the intercellular spaces f the bone marrow. In five patients with acute romyelocytic leukemia the half life of administered abeled fibrinogen was markedly reduced. The accumu- ated evidence indicates that liberation of tissue actor activity of the abnormal promyelocytes results n intravascular coagulation, which is responsible or the accompanying bleeding disorder. The bleed- ng disorder may first appear or may be intensified uring chemotherapy. Good results were obtained by nticoagulation with heparin in a dose of 50 U/kg dministered i.v. every four hr. Intravascular co- gulation in acute promyelocytic leukemia represents working model to explain a variety of coagulation nd clinical abnormalities observed in malignant con- itions.

200 EVIDENCE FOR THE CLONAL ORIGIN OF CHRONIC MYELOID LEUKEMIA FROM A SEX CHROMOSOME MO- AIC: CLINICAL, CYTOGENETIC, AND MARROW CULTURE STUD- ES. *(E.)* Moore, M. A. S. (R. Melbourne Hosp., Aus- ralia), H. Ekert, M. G. Fitzgerald and A. Carmichael. *lood* 43(1):15-22, 1974.

chronic myeloid leukemia (CML) patient with a Phila- elphia chromosome (Ph^1) and a 46XY/47XYY mosaic aryotype was studied to determine whether the cells isplaying leukemic growth characteristics were uni- lonal or multiclonal in origin. Studies of cyto- enetic data, peripheral blood agar cultures and clin- cal features were used. Peripheral blood lymphocyte nd skin fibroblast analysis during the chronic phase nowed a 46XY/47XYY cell line, 47XYY predominating. irect marrow preparations revealed a 46XY, Ph^1 cell ine in both chronic and acute phases. Quinacrine ustard fluorescence permitted definition of cell line aryotypes. Agar culture studies showed a high in- idence of colony- and cluster-forming cells in the hronic phase. Colony formation was completely lost n the acute phase and after therapy. Colony- and luster-forming cells were of abnormal light buoyant ensity. Cytogenetic analysis of leukemic colonies nd clusters showed only 46XY, Ph^1 metaphases. The ata show that cells which displayed leukemic growth characteristics were only of one cell line, 46XY, Ph^1, and thus evidence the uniclonal origin of CML.

5201 CYTOGENETIC EVIDENCE FOR SPLENIC ORIGIN OF BLASTIC TRANSFORMATION IN CHRONIC MYELOID LEUKAEMIA. *(E.)* Mitelman, F. (Univ. Hosp., Lund, Sweden), L. Brandt and P. G. Nilsson. *Scand J Haematol* 13(2):87-92, 1974.

There is evidence that blastic transformation does not occur simultaneously in the bone marrow and spleen in chronic myeloid leukemia (CML). Serial analysis of these tissues using the Giemsa banding technique was performed on a 45 year old female CML patient from the chronic phase until blastic transformation. Initial examination revealed 100% of bone marrow and splenic dividing cells to be 46 chromosome, Ph^1 in karyotype. Six months later a 92 chromosome, 2 Ph^1 karyotype appeared in 31% of the bone marrow and 4% of the splenic cells, with the difference being 46 chromosome, Ph^1. Three months later all samples were 46 chromosome, Ph^1. Three months following that examination 100% of the bone marrow and 94% of the splenic cells were 46 chromosome, Ph^1 while 6% of the splenic cells revealed 48 chromosomes with one extra Ph^1 and one extra chromosome 17. This abnormal clone occurred in 36% of the bone marrow and 78% of the splenic cells four months later. The results show that in CML chronic phase chromosomal abnormalities, aside from the Ph^1, remain normal with additional abnormalities occurring in the terminal phase. These additional abnormalities preceding blastic transformation were found in splenic cells prior to bone marrow cells and therefore the data support previous findings where transformation to blastic crisis was recognized earlier in the spleen.

5202 DIRECT EVIDENCE FOR INVOLVEMENT OF ERYTHROID CELLS IN ACUTE MYELOBLASTIC LEUKAEMIA. *(E.)* Blackstock, A. M. (Dep. Med., Univ. Melbourne, Australia) and O. M. Garson. *Lancet* 2 (7890):1178-1179, 1974.

The involvement of erythroid cells in the acute leukemic process has been suggested. Using chromosomal abnormalities as markers, three acute myeloblastic leukemia patients were studied for radioactive iron incorporation in bone marrow smears. The incorporation followed previously described techniques, with autoradiographed bone marrow smears being stained with May-Grunwald/Giemsa stain. The abnormality of the patients was found in the iron-labeled mitoses. Only erythroid cells showed labeling, with an increased number of erythroid cells being present of the autoradiographed semars. The results show that in acute myeloblastic leukemia, when chromosomal abnormalities exist in the leukemic cells, the same abnormalities exist in the erythroid cells.

5203 THE PATHOGENESIS AND MORPHOLOGY OF PRIMARY HEPATIC CANCER ASSOCIATED WITH OPISTHORCHIASIS. *(Rus.)* Glumov, V. Ia. (Semipalatinsk Med. Inst., USSR), V. V. Kotrikov and N. A. Tretiakov. *Vopr Onkol* 20(9):46-50, 1974.

Pathological examinations were made of liver from 44 patients who died of primary liver cancer; 42 had cancer associated with opisthorchiasis. Histological examination showed that 35 patients had adenocarcinoma. The development of cholangiocellular carcinoma apparently resulted from pathological regeneration of bile duct epithelium. The presence of opisthorchis in the lumen of bile ducts caused proliferation and regeneration and the formation of papillomatous and adenomatous structures. In the opisthorchiasis-prone city of Tobolsk, primary liver cancer accounted for 6.7% of the autopsies; this incidence is nine times higher than in areas not affected by opisthorchiasis. The development of primary liver cancer correlates with severity and length of the invasion.

5204 GLUTAMATE DEHYDROGENASE ACTIVITY RELATED TO HISTOPATHOLOGICAL GRADE OF HEPATOCELLULAR CARCINOMA IN MAN. *(E.)* Glazer, R. I. (Dep. Pharmacol., Emory Univ., Atlanta, Ga.), C. L. Vogel, I. R. Patel and P. P. Anthony. *Cancer Res* 34(11): 2975-2978, 1974.

The study of biochemical markers of cancer for the improvement of early accurate diagnosis is a major direction in cancer research today. Twenty-five human hepatocellular carcinoma patients (16 male, 9 female) were studied to see if glutamate dehydrogenase (GDH) activity in liver and tumor tissues was quantitatively correlated with the histopathological grade of the carcinoma. The patient median age was 40 (range 22 to 62). Abnormally high activities of protocollagen proline hydroxylase (PPH), alkaline phosphatase (AP) and serum glutamic-oxalacetic transaminase (SGOT) were found in 53, 84 and 94% of the patients, resp. Bilirubin levels were high in only 21% of the patients. α-Fetoprotein (AFP) levels ranged from 8 ng to 1.92 mg/ml. Two of seven patients with well-differentiated tumors were qualitatively positive for AFP, while 6/8 patients with poorly differentiated tumors were positive for AFP. GDH activity in the three tumor grades found in the patients studied did not differ significantly. Overall GDH activity for all tumors studied was less than 30% of the activity of normal and cirrhotic liver. It is suggested that the results show the tendency for well-differentiated tumors to be associated with higher GDH levels and less frequently with AFP production than poorly differentiated tumors and that this is supportive of minimal-deviation and molecular correlation concepts.

5205 PROTEIN-BOUND CARBOHYDRATE CONTENT OF NORMAL AND TUMOROUS HUMAN LUNG TISSUE. *(E.)* Bryant, M. L. (Dep. Chem., San Deigo State Univ., Calif.), G. D. Stoner and R. P. Metzger. *Biochim Biophys Acta* 343(1):226-231, 1974.

The protein-bound carbohydrate content of normal and tumor tissue (adenocarcinoma, squamous cell carcinoma, and bronchiogenic carcinoma) of the human lung was investigated by gas-liquid chromatography to determine whether there are differences in the concentration. Tumor cells were treated with neuramidase to measure the amount of enzyme-labile sialic acid on their surfaces. Neoplastic tissue, tissue adjacent to tumor, and tissue obtained at a site distant from the tumor were analyzed. Cells from the three lung tumor types contained from two to four times the amounts of sialic acid, fucose, mannose, galactose, *N*-acetylglucosamine and *N*-acetylgalactosamine than tissue taken at a site distant from the tumor. The amino sugars were present in the highest quantities in all tissues, while fucose was the lowest. The levels of sialic acid and galactose were elevated to higher extents in tumor than mannose. With the exception of *N*-acetylhexosamine, the data show a progressive increase in protein-bound carbohydrate in the transition of normal to neoplastic tissue. Cells taken from a site adjacent to the tumor had values of protein-bound carbohydrate intermediate between tumor and normal tissue. Approximately 62% of the sialic acid obtained from the tumor sample was neuraminidase-labile. These data suggest that human lung tumor cells are synthesizing elevated amounts of glycoprotein, which is probably present on the cell surface.

5206 CELL KINETIC STUDIES IN PATIENTS WITH SMALL CELL CARCINOMA OF THE LUNG. *(E.)* Muggia, F. M. (Natl. Cancer Inst., Bethesda, Md.), S. K. Krezoski and H. H. Hansen. *Cancer* 34(5):1683-1690, 1974.

Cell kinetic studies in 12 patients with small cell carcinoma of the lung were conducted to determine growth characteristics using thymidine labeling index (LI), duration of intermitotic cycle (Tc) of proliferating tumor cells, and of cell cycle phases (G_1, S_1, G_2, M) and proliferative fraction (growth fraction, GF). The technique of intratumoral thymidine injection was used. Aspirates of biopsy samples of injected subcutaneous nodules, lymph nodes, and bone marrow replaced by tumor were processed autoradiographically. The median LI was 16.7% (range 7.2-23.8%). Chemotherapy achieved prolonged remission in three patients with the highest LI prior to treatment. In one patient the duration of DNA synthesis period (Ts) by the labeled mitoses curve method was estimated to be 18.8 hr. Repeated pulses into nodules at intervals less than 12 hr showed a linear rise to 55-44% LI within 48 hr in two other patients. These results suggest that whereas cell cycle times may be similar to those of other human solid tumors, the growth fraction is usually higher in small cell carcinoma of the lung than in other common human malignancies. This parameter may be an important determinant in responsiveness to chemotherapy. Similar studies in other human malignancies, coupled with such clinical correlations, are necessary to confirm this concept.

5207 SIMULTANEOUS IDENTICAL CARCINOMAS IN IDENTICAL TWINS. *(E.)* Hendricks, G. L., Jr. (Geisinger Med. Cent., Danville, Pa.), W. T. Barnes, H. J. Suter and R. C. Eyerly. *Bull Geisinger Med Cent* 26(3):91-93, 1974.

Identical carcinomas of the upper lobe of the left lung were found in identical twins. A 58-year-old white male complained of vertigo and double vision of ten days duration. Bronchoscopy showed a lesion in the left upper lobe bronchus which, on biopsy, proved to be a high-grade squamous cell carcinoma. Due to the presumed presence of cerebral metastasis, radiotherapy was begun; the patient died two months later. Four months after admission, the second twin had a chest roentgenogram which showed a left hilar mass. The mass was histologically diagnosed as a squamous cell carcinoma with metastases in the adjacent bronchial nodes. Pneumonectomy was performed. After doing well for two years, the patient had a recurrence of carcinoma in the bronchial stump and was treated with radiotherapy. The similarity of tumor type, anatomic site, and age of onset in these twins concurred with the general principles of cancer behavior in monozygous twins. This is apparently the first report of this form of cancer occurring stimultaneously at this site in identical twins.

5208 THE COURSE OF RETICULUM CELL SARCOMA AND LYMPHOSARCOMA. AN ANALYSIS OF 268 CASES. *(Fr.)* Hoerni, B. (Bergonié Found., Bordeaux, France), J. Chauvergne, M. Durand, G. Hoerni-Simon, J. Touchard, C. Meuge and C. Lagarde. *Bull Cancer (Paris)* 51(1):61-68, 1974.

An analysis was made of 268 cases of reticulosarcomas and lymphosarcomas in 99 women (average age 57 yr) and 169 men (average age 54 yr). Multiplicity of original tumor sites was associated with a very poor prognosis; all 34 patients died within 3 yr. The five yr survival rate of women was twice that of men, but this observation is marginally significant. The prognosis was poorer for patients over 60 yr old than for younger patients. The one yr survival rate for patients with a diffuse tumor pattern was the same as the five yr survival rate in patients with a nodular tumor pattern. The prognosis was relatively good for patients with stages I and II, and considerably worse for patients with stages III and IV. All patients with generalized clinical signs died within 3 yr. Death was directly attributable to the sarcoma in 138 out of 178 cases. For all patients, the cure rate was 19.4%.

209 THE QUANTITATION OF EXPERIMENTAL LYMPH NODE METASTASIS. *(E.)* Wood, P. (Univ. Weston ark Hosp., Sheffield, England) and I. Carr. *J Pathol* 14(2):85-88, 1974.

istological techniques were used to quantify the proess of metastasis using a proven model of lymph node etastasis. Five litter-mate male rats were given ive million Rd/3 tumor cells in the footpad and killed fter two days. Another group of six litter-mate male ats similarly injected was killed after four days. he footpads were fixed in Bouin's solution and the opliteal lymph nodes in alcohol-formalin-acetic mixure and serial 5 μm sections cut for counting the umor cells at 400 times magnification. There was a rogressive increase in the number of tumor cells in he node. Whereas variability at two days was considrable, by 4 days the lymph nodes had similar sized deposits of about half a million cells. Several purely artificial experimental variables may account for the variable rate of metastasis. It is claimed that these results show for the first time, within broad limits of accuracy, that the implantation of a given mass of tumor is followed by the appearance of a relatively consistent metastic mass in the draining lymph node. It is suggested that the formula used in this study should be applicable in this experimental model to the study of factors affecting metastasis and may also be applicable to the study of metastasis in human lymph nodes.

5210 FREEZE-FRACTURE STUDIES OF GAP JUNCTIONS IN HUMAN MENINGIOMA. *(E.)* Tani, E. (Hyogo Coll. Med., Nishinomiya, Japan), M. Nishiura and N. Higashi. *Acta Neuropathol* 30(4):305-314, 1974.

Biopsy specimens obtained from three meningiocytic and two fibroblastic meningiomas were examined by the freeze-fracture method. The fractures usually passed through the cytoplasm and were within the plasmalemma. Face A of the plasmalemma had many particles 90-110Å in diameter, and face B had a few particles from the cell's interior. Both faces consist of a half membrane attached either to the cytoplasm (face A) or to extracellular space. Gap junctions fractured by this method showed characteristics of either or both faces. The gap junctions in these tumors were 0.1-1 μ in diameter and polygonal or ovoid in shape. Globular particles 70-80Å in diameter were observed in the gap junctions, and appeared to be arranged in a polygonal or hexagonal array, spaced 80Å center-to-center. Pits were observed in the gap junctions having a similar array and spacing as the particles. Careful examination of the particles and pits showed some to exhibit an electron-opaque dot about 20Å in diameter in the center of the particles or pits. A serrated edge was also observed at sites of transition from face A to face B. The structure of the gap junction in human meningiomas is reported to be similar to that in other freeze-fractured tissues. The authors suggest that there is a complementary association of the pits and particles based on their similarities in arrangement and spacing.

5211 THE FREQUENCY AND TOPOGRAPHICAL DISTRIBUTION OF CARCINOMA *IN SITU* WITH BUDS IN THE UTERINE CERVIX. *(E.)* Rubio, C. A. (Dep. Pathol., Karolinska Inst., Stockholm, Sweden). *Acta Pathol Microbiol Scand* [*A*] 82(5):605-612, 1974.

The frequency and distribution of carcinoma *in situ* with buds in the cervical mucosa was investigated in punch and/or cone specimens from 102 consecutive cases with dysplasia or carcinoma *in situ*. Carcinoma *in situ* with buds was found in 20% of the cases and dysplasia with buds in 11% of the cases. Seventeen percent of the cases of carcinoma *in situ* with buds or dysplasia with buds also had atypical epithelium with buds in cone specimens. By comparison, only one of the 68 biopsies with carcinoma *in situ* simplex or dysplasia without buds had buds in atypical epithelium in cone specimens. Studies of the linear extension in sections of cone specimens showed that carcinoma *in situ* with buds represented a small portion (20%) of the total atypical epithelium and only 33% of the areas with carcinoma *in situ*, the remaining being carcinoma *in situ* simplex. In six of ten cones with carcinoma *in situ* with buds, the lesion was limited to only one of the four quadrants. Patients with dysplasia were on the average 5.4 yr younger than those with carcinoma *in situ*, which supports the idea that dysplasia may progress to carcinoma *in situ* if not treated. No differences in age were found for cases classified as carcinoma *in situ* with or without buds. The histological findings and age distribution indicate that carcinoma *in situ* with buds and carcinoma *in situ* simplex are histological variants of carcinoma *in situ*. There is no evidence that carcinoma *in situ* progresses to carcinoma *in situ* with buds.

5212 HYPERPLASIA OF THE ENDOMETRIUM. *(Rus.)* Lyzikov, N. F. (Vitebsk Med Inst., USSR) and V. M. Zholnerobskii. *Akush Ginekol* (4):32-35, 1974.

A study was conducted of 877 cases of endometrial hyperplasia which accounted for 6.2% of the patients hospitalized for gynecological disease in a five-yr period. Endometrial hyperplasia was found in 27.6% of uterine membrane smears by pathological examination. Of the hospitalized patients 67.7% were diagnosed as having hemorrhagic metropathy; 27.5%, polypous endometrium; 3.6%, uterine myoma; and 1.2%, ovarian dysfunction. The highest incidence of endometrial hyperplasia was observed in patients between 41 and 50 yr old. Curettage of the uterus was performed in patients over 40 yr of age; 82.4% received anti-inflamatory treatment; 12.8%, hormonal treatment; 1.8%, x-ray castration; and 3%, hysterectomy. Patients less than 40 yr old were given substitution hormonal therapy or progesterone. It is suggested that hyperplastic changes of the endometrium are not necessarily precancerous and may be reversible.

5213 AN ELECTRON-MICROSCOPE STUDY OF THE ENDOMETRIOID ADENOCARCINOMA OF THE OVARY AND A COMPARISON OF ITS FINE STRUCTURE WITH THAT OF NORMAL ENDOMETRIUM AND OF ADENOCARCINOMA OF THE ENDOMETRIUM. *(E.)* Cummins, P. A. (Dep. Obstet. Gynecol., Univ. Manchester, England), H. Fox and F. A. Langley. *J Pathol* 113(3):165-173, 1974.

An electron microscopic analysis was made of the fine structure of four endometrioid adenocarcinomata of the ovary in comparison with the structure of three primary adenocarcinomata of the endometrium and with normal endometrium in various phases of the menstrual cycle. Findings concerning the fine structure of normal proliferative endometrium were in accordance with previous investigations, with ciliated cells and nuclei with a mesh-basket appearance characteristic. Intracellular glycogen and numerous giant lysosomes were not seen. Increased dilation of rough endoplasmic reticulum, increased complexity of lateral plasma membranes, increase in microtubules, maximal Golgi apparatus development, enlargement of microvilli, loss of cilia and appearance of glycogen characterized the secretory endometrium. The ultrastructure of well-differentiated endometrial adenocarcinoma coincided with that previously seen, confirming the minimal deviation in structure from normal proliferative endometrium. The presence of nuclear bodies, mesh-basket nucleoli, giant lysosomes, multivesticular bodies, myelin figures and scattered amorphous masses containing glycogen characterized both ovarian endometrioid adenocarcinomata and well-differentiated endometrial adenocarcinomata. Little structural resemblance between endometrioid tumors and mucinous and serous ovarian tumors was noted. The results confirm the endometrial nature of endometrioid adenocarcinoma of the ovary and indicate the diagnostic value of a definitive electron microscopic diagnosis in cases involving this neoplasm.

5214 PLEIOTROPIC EFFECTS OF THE GENE FOR RETINOBLASTOMA. *(E.)* Kitchin, F. D. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.) and R. M. Ellsworth. *J Med Genet* 11(3):244-246, 1974.

A genetic analysis was made of second primary tumors in a group of retinoblastoma survivors who were treated during the years 1950-1963. Because of a referral bias, 66% of the cases were bilateral. About 4% of the total series (1130 patients) developed a second tumor and with one exception, the tumors were confined to children with bilateral disease. Most outstanding is the occurrence of seven examples of osteogenic sarcoma in long bones far removed from the radiation field. Since genetic analysis has shown that the first step in bilateral disease is a germinal mutation, it follows that all cells must carry the abnormal gene. The results demonstrate the striking increase in second primary tumors in survivors of bilateral retinoblastoma who carry the mutation and not in the majority of survivors of unilateral disease. Since clearly it is a mutated portion of the genome, not cancer, that is inherited, it appears that the germinal mutation is but the first in a multistep process of neoplastic transformation. It is concluded that the retinoblastoma locus is also concerned with the initiation of other tumors, particularly osteogenic sarcoma of the long bones.

5215 DERMATOFIBROSARCOMA PROTUBERANS. *(E.)* Hashimoto, K. (Memphis Veterans Adm. Hosp., Tenn.), M. H. Brownstein and F. A. Jakobiec. *Arch Dermatol* 110(6):874-885, 1974.

No extensive ultrastructural study of dermatofibrosarcoma protuberans (DFSP) has been previously reported. Seven cases (4 male, 3 female) of DFSP were studied by light microscopy. Patients ranged in age from six to 60 yr. All tumors were localized; two on the back, two on the thigh, one at a costal margin, one in the supraclavicular region and one in the lower abdominal area. Long slender processes were sent out through the intercellular spaces in DFSP. A rough surfaced endoplasmic reticulum was only present in modest amounts. Histiocytic proliferations containing large amounts of phagosomes and lysosomes were not prominant. Microtubules were conspicuous in DFSP. Elaborate nuclear convolutions were noted in DFSP and appeared to be a highly distinctive feature. Fibrous long-spacing collagen appeared in all DFSP tumors studied. Incomplete basal lamina-like material was seen in many DFSP tumors along the plasmalemma. Dendritic melanocytes were seen in one of the seven tumors. The results suggest a definite homogeneity on the ultrastructural level in DFSP. Electron microscopical features rule out histiocytic and Schwann cell origins of DFSP tumors, while they are suggestive of a histogenesis from the endoneural or perineural cell.

5216 YOLK SAC TUMOUR OF THE INFANT TESTIS. *(E.)* Stachura, J. (Med. Acad., Krakow, Poland), A. Urban, M. Depowski and E. Obrapalska. *Neoplasma* 21(3):351-357, 1974.

The histological structure, histogenesis, and prognosis of nine cases of yolk sac tumor developing in infant testes are reported. The histological pattern of all tumors was similar. Some areas showed characteristic adenocarcinomatous differentiation with both tubular, finely cystic and papillary formations, other areas consisted of loose meshworks of undifferentiated cells. Tubules and microcysts communicated with one another and were lined with cuboidal, low columnar, or pyramidal epithelial cells. Papillary structures were seen in 50% of cases. Perivascular mantles of tumor cells were often prominent, sometimes with vacuolated basal part of the cytoplasm. Highly unilateral differentiation into yolk sac structures was observed in one case. The findings support Teilum's view on the germ-cell origin of the yolk sac tumor of infant testes and on the difference between this tumor and the yolk sac tumor (endodermal sinus tumor) of adult testes. The degree of malignancy of the yolk sac tumor of the infant testis is not as high as its structure suggests. Only three of the cases reported were fatal. The other six were cured by orhiectomy, with over ten yr survival in five cases.

217 THE EFFECT OF TRYPSIN AND NEURAMINIDASE ON THE CIRCULATION AND ORGAN DISTRIBUTION OF UMOR CELLS. *(E.)* Sinha, B. K. (Dep. Surg., Univ. anitoba, Winnipeg, Canada) and G. J. Goldenberg. *ancer* 34(6):1956-1961, 1974.

218 RENIN-SECRETING TUMOR ASSOCIATED WITH HYPERTENSION. *(E.)* More, I. A. R. (Dep. athol., Univ. Glasgow, Scotland), A. M. Jackson and . N. M. MacSween. *Cancer* 34(6):2093-2102, 1974.

219 DIFFUSE PERIVENTRICULAR AND MININGEAL GLIOMA. *(E.)* Bhrany, D. (St. Louis Univ. Med. Sch., o.), M. G. Murphy, S. Horenstein and S. W. Silbert. *cta Neuropathol (Berl)* 30(3):243-249, 1974.

5220 MEDULLOBLASTOMA IN ADULTS: A SERIES OF 22 CASES. *(It.)* Marty-Double, C. (St. Eloi Clin., Montpellier, France) and G. Barneon. *Ann Anat Pathol (Paris)* 19(2):189-210, 1974.

5221 MORPHOLOGICAL ONCOTYPISM OF MEDULLOBLASTOMAS. *(Ger.)* Muller, W. (Pathol. Inst., Univ. Cologne, W. Germany) and H. E. Schaefer. *Acta Neuropathol (Berl)* 30(1):51-61, 1974.

5222 PRECANCEROUS LESIONS IN THE GASTROINTESTINAL TRACT. *(Ger.)* Eder, M. (Inst. Pathol., U. Munich, Germany). *Langenbecks Arch Chir* 337:757-761, 1974.

5223 FAMILIAL POLYPOSIS OF THE GASTROINTESTINAL TRACT. *(E.)* Utsunomiya, J. (Tokyo Med. Dent. Univ., Japan). *Asian Med J* 17(2):61-64, 1974.

5224 CENTRAL MUCOEPIDERMOID CARCINOMA ARISING IN A MAXILLARY ODONTOGENIC CYST. *(E.)* Marano, P. D. (No affiliation) and K. S. Hartman. *J Oral Surg* 32(12):915-919, 1974.

5225 PRIMARY MULTIPLE CARCINOMAS LOCATED IN THE MAXILLARY SINUS AND UTERUS. *(Rus.)* Shapiro, L. M. (Moscow Res. Inst. Otorhinolaryngol., USSR). *Zh Ushn Nos Gorl Bolezn* (4):105-106, 1974.

5226 ASSOCIATION OF LARYNGEAL CANCER ANC LARYNGOCELE. *(Rus.)* Smirnova, I. N. (Omsk Munic. Outpatient Clin. Oncol., USSR). *Zh Ushn Nos Gorl Bolezn* (4):106-108, 1974.

5227 MALIGNANT RETICULUM CELL TUMOR OF THE LARYNX. *(Rus.)* Shubenko-Gabuzova, I. N. (Bur. Forensic Med., Min. Health Azerbaidzhan SSR, Baku, USSR). *Zh Ushn Nos Gorl Bolezn* (4):108-109, 1974.

5228 LIPID HISTOCHEMISTRY IN LARYNGEAL CARCINOMAS WHICH HAVE NOT BEEN TREATED CONSERVATIVELY. *(Rus.)* Senchenko, L. S. (Kiev Res. Inst. Otorhinolaryngol., USSR). *Zh Ushn Nos Gorl Bolezn* (3):18-23, 1974.

5229 DOUBLE PRIMARY MALIGNANT LESION OF THE OESOPHAGUS--A CASE REPORT. *(E.)* Suri, R. K. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India), H. Singh, S. Jain, and J. S. Gujral. *Indian J Cancer* 11(4):444-447, 1974.

5230 THE SINGLE THYROID NODULE AND CARCINOMA. *(E.)* Messaris, G. (Second Dep. Surg., Univ. Athens, Greece), K. Kyriakou, P. Vasilopoulos and C. Tountas. *Br J Surg* 61(12):943-944, 1974.

5231 ASSOCIATION OF A CARCINOMA OF THE PIRIFORM RECESS WITH A CARCINOMA OF THE THYROID MEDULLA. *(Fr.)* Haguenauer, J. P. (Red Cross Hosp., Lyon, France) J. Gaillard, H. Lafon and B. Jakubowicz. *J Fr Otorhinolaryngol* 23(10):869-873, 1974.

5232 MEDULLARY CARCINOMA OF THE THYROID: ULTRASTRUCTURE, MONOLAYER CULTURE, BLOOD THYROCALCITONIN, THE TUMOR AND CULTURE MEDIA. *(Fr.)* Codaccioni, J. L. (Conception Hosp., Marseille, France) B. Argemi, G. Fayet and N. Sudan. *Ann Endocrinol (Paris)* 35(3):287-288, 1974.

5233 THE DERIVATION OF SO-CALLED "GIANT-CELL" AND "SPINDLE-CELL" UNDIFFERENTIATED THYROIDAL NEOPLASMS. *(E.)* Fisher, E. R. (Shadyside Hosp., PIttsburgh, Pa.), R. Gregorio, R. Shoemaker, B. Horvat and C. Hubay. *Am J Clin Pathol* 61(5):680-689, 1974.

5234 THE AZYGOS SYSTEM IN ADVANCED INTRATHORACIC NEOPLASMS. *(Sp.)* Cicero, R. (Gen. Hosp., Sec. Health Welfare, Mexico City) F. Cano and H. del Castillo. *Arch Invest Med (Mex)* 5(3):585-594, 1974.

5235 DEVELOPMENT OF LUNG CANCER. *(It.)* Biancifiori, C. (Fac. Med. Surg., Univ. Pisa, Italy), R. Ribacci, L. Severi and F. Squartini. *Arch De Vecchi Anat Patol* 58(1/2/3):135-176, 1973.

5236 MORPHOLOGICAL STUDY OF SPHERICAL CARCINOMAS OF THE LUNG. *(It.)* Tonelli, L. (Clin. Gen. Surg., Univ. Florence, Italy). *Arch De Vecchi Anat Patol* 58(1/2/3):225-239, 1973.

5237 PATHOLOGICAL ANATOMY OF BRONCHIAL CARCINOMA. *(Ger.)* Fisher, R. (Pathol. Inst., Univ. Cologne, W. Germany). *Roentgenblaetter* 27(4):159-164, 1974.

5238 TUBULORETICULAR STRUCTURES IN A CASE OF BRONCHIALADENOMA (CARCINOID TYPE). *(E.)* Alves de Matos, A. P. (Hosp. St. Maria, Lisbon, Portugal). *Experientia* 30(12):1465-1466, 1974.

5239 PLEURAL AND PULMONARY DISEASE CAUSED BY ASBESTOS. *(Fr.)* Boutin, C. (Paoli-Calmettes Inst., Marseille, France). R. Choux, J. Hassoun, A. Mathias, J. F. Dumon and J. Viallat. *Marseille Med* 111(12):625-643, 1974.

5240 MAMMARY ANGIOHAMARTOMAS AND ANGIOBLASTOMAS: 12 CASES. *(It.)* Sannicola Botticelli, C. (Inst. Anat. Pathol. Histol., Univ. Modena, Italy) and G. Botticelli. *Arch De Vecchi Anat Patol* 59(2): 319-338, 1973.

5241 PAPILLOMA AND PAPILLARY CARCINOMA OF THE BREAST. *(It.)* Ninfo, V. (Inst. Pathol. Anat. Histol., Univ. Padua, Italy) and P. Dalla Palma. *Pathologica* 66(955/956):195-207, 1974.

5242 THE MYOEPITHELIUM IN HUMAN BREAST FIBROADENOMA. *(E.)* Ahmed, A. (Dep. Pathol., Univ. Manchester, England). *J Pathol* 114(3):135-138, 1974.

5243 MORPHOLOGY AND BIOLOGY OF FOUR TRANSPLANTABLE RETICULUM CELL TUMORS INDUCED IN BALB/c/Cb/Se AND C57BL/Cb/Se MICE WITH ASCITES MAMMARY CARCINOMA (ATPC+). *(It.)* Maltzeff, N. (Cancer Res. Div., Univ. Perugia, Italy). *Lav Ist Anat Istol Patol Perugia* 33(2):59-71, 1973.

5244 INVESTIGATIONS OF 17-KETOSTEROID EXCRETION IN MASTOPATHIA AND PREMENOPAUSAL BREAST CANCER. *(E.)* Hindy, I. (Natl. Oncol. Inst., Budapest, Hungary), N. Prajda, L. Tapolcsanyi, C. Sellei and S. Eckhardt. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:188-190, 1974.

5245 EARLY MULTICENTRIC GASTRIC CARCINOMA: TWO CASES. *(Ger.)* Gassmann, R. (Pathol. Inst., Univ. Zurich, Switzerland), E. Leuthold, R. Siebenmann and E. Pfenninger. *Z Gastroenterol* 12(8):604-605, 1974.

5246 PRIMARY GASTRIC SARCOMA. *(Ger.)* Schumpelick, V. (Surg. Clin., Univ. Hamburg, Germany). *Z Gastroenterol* 12(7):519-528, 1974.

5247 PRIMARY NEOPLASMS OF THE GASTRIC STUMP. *(Sp.)* Moreno, C. (Dept. Gastrointestinal Surg., Jimenez Diaz Fdn., Spain) and J. M. Culebras Fernandez. *Rev Esp Enferm Apar Dig* 44(8):785-796, 1974.

5248 DOUBLE PRIMARY CANCERS OF THE SMALL INTESTINE AND THE STOMACH: REPORT OF A CASE. *(E.)* Matsuo, T. (Hyogo Prefect. Awaji Hosp., Sumoto, Japan), T. Yao and K. Miyasaki. *Kobe J Med Sci* 29(3/4):97-102, 1974.

5249 SURFACE STRUCTURE OF CANCER CELL WITH SPECIAL REFERENCE OF THE CELL COAT IN ASCITES HEPATOMAS. *(Jpn.)* Kojima, K. (Cancer Research Center, Aichi Prefecture, Japan) and K. Koizumi. *Tampakushitsu Kakusan Koso* 19(3):202, 1974.

5250 ADENOCARCINOMA OF THE BLADDER. *(It.)* Bolis, G. B. (Inst. Pathol. Anat. Histol., Univ. Perugia, Italy). *Lav Ist Anat Istol Patol Perugia* 33(2):51-58, 1973.

251 CYTOPHOTOMETRIC AND CYTOLOGICAL CHARACTERIZATION OF THE DEGREE OF MALIGNANCY OF TUMORS
N THE TRANSITIONAL EPITHELIUM OF THE BLADDER. *(Ger.)*
ederer, B. (Pathol. Inst., Univ. Innsbruck, Austria),
. Mikuz, G. zur Needen and W. Gutter. *Verh Dtsch*
es Pathol 57:200-203, 1973.

252 FLORID KERATOACANTHOMAS IN A KIDNEY TRANSPLANT RECIPIENT. CASE REPORT. *(E.)* Jacobs-
on, S. (Dep. Plast. Surg., Allmanna Sjukhuset, Malma,
weden), F. Linell, A. Rausing. *Scand J Plast Reconstr*
urg 8(3):243-246, 1974.

253 DYSONTOGENETIC NEOPLASIA OF THE FEMALE GENITALIA. FORMAL AND ONTOHISTOGENETIC
IFFERENCES BETWEEN MIXED MESODERMAL TUMORS, MULLERIAN
UMORS AND STROMAL SARCOMA OF THE UTERUS. *(It.)*
omasino, R. M. (Inst. Anat. Pathol. Histol., Univ.
alermo, Italy), A. Perino and M. Anastasi. *Arch De*
ecchi Anat Patol 59(2):293-318, 1973.

254 THE STRUCTURE AND DIFFERENTIAL DIAGNOSIS OF ADAMANTINOMAS OF THE TIBIA: A LIGHT AND
LECTRON MICROSCOPE STUDY. *(Ger.)* Kohler, G. (Pathol.
nst., Univ. Heidelberg, Germany), J. A. Rossner and R.
aldherr. *Verh Dtsch Ges Pathol* 58:454-458, 1974.

255 CERVICAL CARCINOMA FOLLOWING REMOVAL OF DISEASED TISSUE FROM THE PORTIO. *(Ger.)*
unghans, E. (Rendsburg Munic. Hosp., Germany), V.
achs and M. Wanke. *Med Welt* 25(45):1878-1884, 1974.

256 ESTROGEN EXCRETION AND KOLPOCYTOLOGICAL EXAMINATION OF PATIENTS WITH CARCINOMA OF
HE UTERINE CORPUS. Keller, G. (Pecs Med. Univ.,
ecs, Hungary), I. Szigetvari, I. Rakoczi and L.
ecskes. *Mag Onkol* 18(2):100-104, 1974.

257 FUNCTIONING PRIMARY CARCINOID TUMOR OF THE OVARY. A LIGHT- AND ELECTRON-MICROSCOPIC
UDY WITH REVIEW OF THE LITERATURE. *(E.)* Qizilbash,
H. (Henderson Gen. Hosp., Hamilton, Canada), R. G.
ebilcock, M. C. Patterson and K. G. Lamont. *Am*
Clin Pathol 62(5):629-638, 1974.

58 SUPRACLAVICULAR LYMPHADENOPATHY AND CARCINOMA OF THE PROSTATE: ASPIRATION CYTOLOGY
THE DIAGNOSIS OF BOTH. *(E.)* Fletcher, D. R.
remantle Hosp., Australia) and S. R. Orell. *Med*
Aust 2(24):866-869, 1974.

59 THE EFFECT OF LOCATION IN THE ORGAN AND OTHER FACTORS ON THE COMPETENCY OF NORMAL
D TUMOR CELLS STUDIED IN THE CYTOGENESIS OF LEYDIG
LL TUMORS AND SARCOMAS OF THE TESTES. *(It.)*
sta, A. (Inst. Pathol. Anat., Univ. Florence, Italy)
d F. Gori. *Arch De Vecchi Anat Patol* 58(1/2/3/):
3-134, 1973.

5260 EMBRYONAL ADENOCARCINOMA OF INFANT TESTIS. *(E.)* Singhal, G. D. (Inst. Med. Sci., Banaras Hindu Univ., Varanasi, India) and Y. J. Ramakrishna *Indian J Surg* 36(4):161-162, 1974.

5261 BENIGN PAPILLARY TUMOUR OF RETE TESTIS. *(E.)* Gupta, R. K. (M.L.B. Med. Coll., Jhansi, India). *Indian J Cancer* 11(4):480-481, 1974.

5262 OCCURRENCE OF ATYPICAL CHANGES IN COLORECTAL POLYPS ACCORDING TO THE FAMILIAL HISTORY OF GASTRO-INTESTINAL TRACT MALIGNANCIES. *(E.)* Crespi, M. (Regina Elena Inst. Cancer Res., Rome, Italy), A. Bigotti, S. Di Matteo and V. Casale. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:269-275, 1974.

5263 CONDYLOMA ACUMINATUM AND CANCER OF THE ANUS: TWO CASES OF PROBABLE MALIGNANT TRANSFORMATION. *(Fr.)* Vilotte, J. (Bichat Hosp., Paris, France), P. Neuburger, E. Sonsino and J. M. Mesnier *Arch Fr Mal App Dig* 63(7):595-602, 1974.

5264 FIBROLEIOMYOMA OF THE EPIDIDYMIS. *(It.)* Dalla Pria, A. F. (Inst. Anat. Pathol. Histol., Univ. Modena, Italy), G. Salmeri and A. Semerjian. *Arch De Vecchi Anat Patol* 59(2):371-382, 1973.

5265 SYSTEMIC NEVI: A HAIRY NEVUS, MULTIPLE ERUPTIVE NEVI AND NEVUS CELL INFILTRATIONS IN THE LYMPH NODES. *(Ger.)* Honigsmann, H. (1st Dermatol. Clin., U. Vienna, Austria), K. Wolff and K. Konrad. *Hautarzt* 25(11):547-553, 1974.

5266 HODGKIN'S DISEASE AND THE LIVER. *(E.)* Cowan, R. (Greenwich Hosp. Gastrointest. Unit, London, England) and J. R. Trounce. *Guys Hosp Rep* 122(384):221-230, 1973.

5267 HODGKIN'S DISEASE IN CHILDREN: 45 CASES. *(Fr.)* Brunat, M. (Lab. Pathol. Anat., Leon Berard Ctr., Lyon, France) J. Gilly, P. Noel, P. A. Bryon, A. Auduge and O. Gentilhomme. *Lyon Med* 231(11): 1041-1048, 1974.

5268 PROMYELOCYTIC LEUKEMIA. *(Ger.)* Loffler, H. (Ctr. Internal Med., U. Giessen, Germany), D. Kaiser and H. Pralle. *Verh Dtsch Ges Inn Med* 80:1495-1497, 1974.

5269 DI'GUGLIELMO'S DISEASE AND ACUTE MYELOBLASTIC LEUKAEMIA IN COUSIN BROTHERS: RELEVANCE TO THE INTER-RELATED PARENTS. *(E.)* Phatak, A. G. (Miraj Med. Coll., India) and A. G. Gujar. *J Assoc Physicians India* 22(12):923-927, 1974.

5270 THE MITOSIS AND DIFFERENTIATION OF LEUKEMIA CELLS IN PATIENTS WITH ACUTE LEUKEMIA. *(Ger.)* Hoelzer, D. (Dept. Clin. Physiol., U. Ulm, W. Germany) and E. Kurrie. *Verh Dtsch Ges Inn Med* 80:1486-1487, 1974.

5271 T- AND B-LYMPHOCYTES IN NORMAL SUBJECTS OF VARIOUS AGES AND IN PATIENTS WITH LYMPHOPROLIFERATIVE DISEASES. *(Ger.)* Augener, W. (Med. Clin., U. Essen, W. Germany), G. Cohnen, A. Reuter and G. Brittinger. *Verh Dtsch Ges Inn Med* 80:1617-1619, 1974.

5272 SCANNING ELECTRON MICROSCOPY OF NORMAL AND LEUKEMIC HUMAN LYMPHOCYTES. *(Sp.)* Renau Piqueras, J. (Inst. Cytol. Res., Valencia, Spain), J. Hernandez Yago, A. Martinez Ramon and G. Forteza Bover. *Sangre* 19(3):281-294, 1974.

5273 BONE MARROW CHANGES IN LYMPHORETICULAR SARCOMAS. *(Fr.)* Duhamel, G. (St. Antoine Hosp., Paris, France), J. Debray, N. C. Gorin, M. Krulik, A. Najman, J. Deloux, T. Bonal and R. Andre. *Sem Hosp Paris* 50(37/38):2317-2324, 1974.

5274 HISTOLOGICAL CHANGES IN THE BONE MARROW IN MYELOPROLIFERATIVE DISORDERS. *(Jpn.)* Kimura, M. (Hirosaki Univ. Hosp., Japan) and Nagai, K. *Jpn J Clin Pathol* 22(10):700-704, 1974.

5275 A MORPHOLOGICAL STUDY OF ASPIRATED BONE MARROW IN MYELOPROLIFERATIVE DISORDERS: COMPARISON OF SMEARS AND ROUTINE SECTIONS. *(Jpn.)* Watanuki, T. (Akita Univ. Sch. Med., Japan). *Jpn J Clin Pathol* 22(10):705-721, 1974.

5276 ULTRASTRUCTURE OF BENIGN JUVENILE MELANOMA: STUDY OF SEVEN CASES. *(Fr.)* Gomez Orbaneja, J. (Fac. Med., Univ. Complutense, Madrid, Spain), P. Simon Huarte, E. Sanchez Yus and L. Diaz Flores. *Ann Dermatol Syphiligr (Paris)* 101(5/6):497-507, 1974.

5277 ATTEMPT AT PHYSIOPATHOLOGICAL INTERPRETATION OF A NONSECRETING MYELOMA BASED ON A NEW CASE. *(Fr.)* Fabia, F. (Franco-Musulman Hosp., Bobigny, France), J. Burnichon and P. Cornillot. *Pathol Biol (Paris)* 22(7):617-620, 1974.

5278 A CASE OF PULMONARY HEMANGIOPERICYTOMA. *(Fr.)* Paplinski, Z. (Acad. Med., Lublin, Poland), A. Sawa and E. Korobowicz. *Ann Chir Thorac Cardiovasc* 13(4):323-326, 1974.

5279 THE MORPHOLOGY AND ULTRASTRUCTURE OF EWING'S TUMOR. *(Ger.)* Llombart-Bosch, A. (Pathol. Inst., Univ. Murcia, Spain) and R. Blache. *Verh Dtsch Ges Pathol* 58:459-466, 1974.

5280 ELECTRON MICROSCOPE AND CYTOPHOTOMETRIC STUDIES OF CHORDOMAS. *(Ger.)* Mikuz, G. (Pathol. Inst., Univ. Innsbruck, Austria) and F. Mydla. *Verh Dtsch Ges Pathol* 58:447-453, 1974.

5281 RABIES-LIKE NEURONAL INCLUSIONS ASSOCIATED WITH A NEOPLASTIC RETICULOSIS IN A DOG. *(E.)* Cameron, A. M. (Coll. Vet. Med., Univ. Illinois, Urbana) and J. D. Conroy. *Vet Pathol* 11(1):29-37, 1974.

5282 NODULAR TENOSYNOVITIS. BENIGN GIANT CELL SYNOVIOMA. *(E.)* Baes, H. (H. Serruys Hosp., Ostend, Belgium) and W. Tanghe. *Dermatologica* 149(3):149-154, 1974.

5283 TWO FAMILIAL CASES OF FABRY'S DIFFUSE ANGIOKERATOMA. *(Fr.)* Marill, F. G. (No affiliation), M. Lounes and M. N. Seba. *Bull Soc Fr Dermatol Syphiligr* 81(5):463-465, 1974.

5284 MULTIPLE ENDOCRINE TUMORS WHICH ARE NOT MANIFESTED CLINICALLY: ONE CASE. *(Fr.)* Leroy, J. P. (Fac. Med., Brest, France), G. Balouet and J. Caraes. *Arch Anat Pathol (Paris)* 22(3):219-223, 1974.

5285 MUCUS-SECRETING CARCINOMA OF THE ECCRINE GLANDS. *(Ger.)* Metz, J. (Dermatol. Clin., U. Wurzburg, W. Germany), N. Filipp and G. Metz. *Z t Haut Geschlechtskr* 49(22):963-974, 1974.

See also:

* (Rev): 4808, 4822, 4826, 4829, 4852, 4853, 4854, 4855, 4856
* (Chem): 4873, 4920, 4940, 4941, 4947, 4949
* (Phys): 4959, 4966, 4967
* (Immun): 5079
* (Epid): 5295, 5296, 5298, 5299

5286 DANISH CANCER REGISTRATION 1942-1974. *(E.)* Anonymous. *Acta Pathol Microbiol Scand [A]* (Suppl 247):9-34, 1974.

The organization, major contributions, and statistical guidelines of the Danish Cancer Registry are reviewed. To achieve a high degree of comparability of results, the basic statistical publications issued by the registry since 1965 have followed the recommendations of the International Cancer Union's Committee for Geographical Pathology of Cancer. The notification of cases to the registry is described together with the lesions reportable and the personal data recorded. Codings used by the registry to classify malignant neoplasms according to site are listed in a table that also shows the corresponding World Health Organization codings. Population data are given for Copenhagen and its suburbs, provincial towns, and the number of workers in various industries. The distribution of physicians and the number of hospitals and of hospital beds are indicated. A comparison of cancer cases coming to the attention of the registry through death certificates or through voluntary hospital notification shows a decrease in the percent of deaths identified through the death certificate only, an increase in the percent of hospital admissions with notification, and a consequent drop in the percent of failing notification from hospitals.

5287 HL-A ANTIGENS AND BREAST CANCER. *(E.)* De Jong-Bakker, M. (Netherlands Cancer Inst., Amsterdam), F. J. Cleton, J. D'Amaro, J. J. Keuning and J. J. Van Rood. *Eur J Cancer* 10(9):555-558, 1974.

Frequencies of HL-A antigens in 200 patients with reast cancer were compared to those in 200 matched controls to determine the relationship of the antigens o the disease. Following HL-A typing, correlations etween antigen frequency and clinical data were calulated. No correlation was found between HL-A antigens and breast cancer, but an increased frequency of he combination HL-A 9-HL-A 27 was observed. A study f breast cancer families is suggested to search for inkage of genetic markers with breast cancer and to etermine the possibility of HL-A haplotypes.

288 EPIDEMIOLOGY OF CANCERS OF THE DIGESTIVE TRACT. *(Fr.)* Audiger, J. C. (Hosp. douard-Herriot, Lyon, France) and R. Lambert. *rch Fr Mal App Dig* 63(5):413-432, 1974.

his review is organized into separate consideraion of esophageal, stomach, intestinal and rectal ites. Cancer incidence by age, sex, blood group, nd heredity is reviewed with respect to such preisposing factors as polyps, esophagitis, gastritis nd colitis. Regional (geographic) incidence both y nation and by province is presented. Mortality urves for France from 1952-1968 are shown with a ecrease in incidence of stomach cancer. Carcinoenic factors are presented, such as soil and atospheric constituents, smoking, diet (including lcohol consumption), intestinal flora (their rectivity with non-carcinogenic substances to produce carcinogens), active ingested carcinogens, food gut-transit times and socioeconomic factors. A brief outline of diagnostic methods for cancer of the four sectors of the alimentary canal is given.

5289 CLINICAL AND EPIDEMIOLOGICAL ANALYSIS OF LEUKEMIA CASES AMONG THE POPULATION OF KIELCE AND KIELCE DISTRICT TREATED IN THE DISTRICT HOSPITAL BETWEEN 1959-1970. *(Pol.)* Wojtasik, W. (Dist. Hosp., Kielce, Poland). *Przegl Lek* 31(4):461-465, 1974.

Between 1959-1970 there were 168 newly diagnosed cases of leukemia in the regional hospital in Kielce. They included 66 women and 102 men over the age of 14 yr (68 agricultural workers, 64 laborers and 36 white collar workers). There were 39 cases of acute leukemia (25 myeloblastic, 11 micromyeloblastic, two promyelocytic, one monocytic), 72 cases of chronic granulocytic leukemia and 57 cases of chronic lymphocytic leukemia. Over the 12-yr observation period the morbidity increased from 0.0049% to 0.010% of the population and from 0.07 to 0.12% of all hospitalizations. Analysis of the incidence in 1959-1964, as compared to 1965-1970, revealed a statistically significant average yearly increase from 10 to 18 (for acute from 2.33 to 4.16, for chronic granulocytic from 3.83 to 8.16, for chronic lymphocytic from 3.83 to 5.66). In the 14-29 yr age group (18 patients), acute leukemia was most prevalent (13 cases); among older patients chronic leukemia predominated: it accounted for 54 (26 granulocytic, 28 lymphocytic) of 62 cases in the 46-60 yr age group and 50 (29 granulocytic, 21 lymphocytic) out of 55 patients > 60 yr old. Among the older patients there were many more men (41) than women (8) with lymphocytic leukemia.

5290 CHILDHOOD LEUKEMIA AND MATERNAL INFECTIOUS DISEASES DURING PREGNANCY. *(E.)* Curnen, M. G. C. (Columbia Univ. Sch. Public Health, New York, N.Y.), A. A. O. Varma, B. W. Christine and L. R. Turgeon. *J Natl Cancer Inst* 53(4):943-947, 1974.

A retrospective correlation study was conducted to test the hypothesis that children born of women exposed to influenza, German measles, measles, mumps, whooping cough, chicken pox, or poliomyelitis during pregnancy have a higher risk of developing leukemia. The Connecticut Tumor Registry has records of 431 children born in Connecticut who developed leukemia during their first ten yr of life. The ten-yr leukemia rates of the 27 annual birth cohorts, from 1935 through 1961, demonstrated a nonsignificant seasonal variation by month of birth. The monthly incidence in Connecticut for the seven infectious diseases was used to define epidemic and non-epidemic months. Tenyear rates for lymphocytic, myelocytic, and other types of leukemia were computed for each monthly birth cohort. Birth cohorts who lived through high-prevalence periods of infectious diseases during their first, second, or third trimester of gestation were compared to the remaining control cohorts who were less likely to have been exposed to these infections. The two risk groups had no significant differences in leukemia rates. Thus, no positive relation between time trends in the occurrence of childhood leukemia as related to time trends in the occurrence of influenza during the intrauterine life of the children could be established. Similarly, no evidence was found to show that prevalence of German measles, measles, mumps, whooping cough, chicken pox, or poliomyelitis was associated with childhood leukemia. These findings conflict with some previously reported studies.

5291 MALIGNANT DISEASE IN THE PARENTS OF CHILDREN DYING OF HODGKIN'S DISEASE. *(E.)* Leighton, P. (Cancer Epidemiol. Clin. Trials Unit, Oxford, England), P. G. Smith, G. J. Draper, and M. C. Pike. *Br J Cancer* 30(4):373-375, 1974.

The possibility that Hodgkin's disease may be contagious was investigated in a survey of parents of children up to 16 yr of age who had died of the disease. Of 261 cases of the disease in children from 1953-1967, a total of 502 parents were considered to be the at risk population; the fathers of 14 illegitimate children and the parents of three adopted children were not traced. In computing the expected number of deaths in the parents, each mother was assumed to be at risk from the birth of the child, and each father from the estimated time of conception. Parents incompletely traced, or untraced, were assumed to be alive at the time of the child's death, and in 87 parents where the date of birth was unknown, their age was assumed to have been 30 yr at the birth of the child. Thirteen parents died during the study period, three of neoplasia. One parent died of Hodgkin's disease, in comparison to 0.12 deaths calculated to be expected from this cause. No conclusions can be drawn about a familiar risk factor in this disease, but it suggested that this line of study be carried further, using older patients and their parents, spouses and sibs.

5292 EPIDEMIOLOGIC SURVEY OF LEUKEMIA IN PERSONS POTENTIALLY EXPOSED TO BENZENE. *(E.)* Thorpe, J. J. (Exxon Corp., New York, N.Y.). *J Occup Med* 16(6):375-382, 1974.

To study whether low level exposure to benzene influences the occurrence of leukemia, medical records and job history data amassed by eight European Exxon affiliates from 1962 to 1971 were analyzed. In the 15-85 year age group studied, eighteen cases of leukemia were reported. Eight cases were classified exposed (potential exposure to 1% or more benzene for five or more years); and ten not exposed. The Standardized Mortality Ratio (SMR) equaled 77% with a 95% confidence interval of 113%-41%. Comparison of job title and age in leukemia cases with exposed and not exposed categories revealed no correlation. Expected *vs* observed leukemia deaths of the total population of exposed and not exposed groups showed no significant difference. It is suggested that there is no abnormal occurrence of leukemia in the population of 38,000 petroleum workers as compared to the populations of the nations concerned. The need for improvement in record keeping and storaging of biological observations, job histories, occupational exposures and demographic data was noted.

5293 MOLECULAR BASIS OF CELL PROLIFERATION: THE CELL CYCLE. *(E.)* Studzinski, G. P. (Jefferson Med. Coll., Phila., Pa.). *Ann Clin Lab Sci* 4(2):115-120, 1974.

The molecular basis of cell proliferation is discussed with emphasis on the cell cycle, which is composed of G1 (G for gap), S, G2 and M phases. It is believed that a newly divided cell, after a variable rest interval, prepares for DNA replication (G1). The period of DNA synthesis of S phase is not immediately followed by cell division, but by the G2 phase, apparently free of synthetic activity, which intervenes between the S phase and mitosis. In mammalian cells the "decision" to replicate takes place in the G1 phase. A number of cell constituents have been proposed as regulators of cell replication including: cyclic AMP, polyamines, poly (ADP-ribose) and non-histone chromosomal proteins. That cyclic AMP may have growth regulatory properties is suggested by the fact that it is present in higher concentrations in confluent than in logarithmically growing cultured mammalian cells, and that stimulation of confluent cultures to proliferate causes a drop in intercellular cyclic AMP concentrations. Stabilization of ribosomes by polyamines may initiate the events leading to DNA replication. The action of poly (ADP-ribose) is unclear. It may maintain chromosomal structure or enhance the ability of the cell to replicate DNA or it may act as a negative control agent of DNA replication, perhaps by inhibiting improper initiation of DNA synthesis. The non-histone chromosomal proteins may have a role in the control of gene expression. Their synthesis undergoes an early and marked increase after exposure to stimuli which lead to DNA replication. Only some classes of non-histone chromosomal proteins are synthesized in response to a stimulus to proliferate. It is suggested that stimulus to proliferate results in the synthesis of specific proteins on messenger RNA templates in the cytoplasm, and that these proteins migrate to the nucleus, attach to the chromosome and modify its RNA transcribing capability. This starts a series of reactions which result in the synthesis of precursors and enzymes for DNA synthesis and culminate in DNA replication and cell division.

5294 EPIDEMIOLOGICAL STUDY OF PRIMARY BRONCHIAL CARCINOMA IN CORSICA. *(Fr.)* Poirier, R. (J. Paoli Y. Calmette Inst., Marseille, France). H. Longefait, J. P. Kleisbauer and J. Charpin. *Marseille Med* 11(11):576-579, 1974.

5295 CARCINOMA OF STOMACH--A STUDY OF 200 CASES. *(E.)* Sivanagamani, K. (Kurnool Med. Coll., India), D. B. Reddy and G. C. Raju. *Indian J Cancer* 11(4):437-443, 1974.

5296 STUDY OF GASTRIC CARCINOMA. *(E.)* Sharma, P. (Tata Mem. Hosp., Bombay, India). *Indian J Cancer* 11(4):406-418, 1974.

5297 PREVALENCE OF VERRUCOUS PAPILLOMAS OF THE HANDS IN WORKERS EXPOSED TO OCCUPATIONAL FACTORS. *(Sp.)* Pavese, E. N. (Inst. Soc. Welfare Ind. Hyg., Mar del Plata, Argentina) and R. A. de Torres. *Med Segur Trab* 22(87):45-57, 1974.

5298 EVALUATION OF OVARIAN CARCINOMA FROM THE CLINIC FOR GYNECOLOGY AND OBSTETRICS, 1965-1970. *(Ser.)* Petronijevic, A. (Med. Fac., Univ. Belgrad, Yugoslavia), M. Brocic and M. Krstic. *Srp Arh Celok Lek* 102(6):439-445, 1974.

5299 TERATOMAS IN CHILDREN: REVIEW OF CASES IN THE 0-12 YEAR AGE GROUP SEEN AT HARARI HOSPITAL OVER TEN YEAR PERIOD, 1960-1969. *(E.)* Mambo, N. C. (Harari Hosp., Salisbury, Rhodesia). *Cent Afr J Med* 20(11):231-235, 1974.

5300 EPIDEMIOLOGY OF LEUKEMIA IN PET ANIMALS WITH SPECIAL REFERENCE TO ZOONOTIC ASPECTS. *(E.)* Reif, J. S. (Sch. Vet. Med., Univ. Pennsylvania, Philadelphia). *Medicina (B Aires)* 34(Suppl. 1)75-80, 1974.

5301 STUDY ON KINETICS OF CELL PROLIFERATION DURING THE ESTABLISHMENT OF MOUSE UTERINE CERVIX CARCINOMA. *(E.)* Hasegawa, K. (Sch. Med., Kobe Univ., Japan). *Acta Obstet Gynaecol Jpn* 20(1):62, 1973.

5302 THE PROLIFERATIVE ACTIVITY OF BLAST POPULATIONS IN PAS-TYPE LEUKEMIA. *(Ger.)* Desaga, J. F. (Cent. Internal Med., Univ. Giessen, Germany), D. M. R. Schmidt, A. Schmidt-Menard, R. Luck and D. Loffler. *Verh Dtsch Ges Inn Med* 80:1490-1492, 1974.

5303 A METHOD OF COMPARING DIFFERENCES IN TUMOUR GROWTH RATES APPLIED TO A STUDY OF THE INCREASING GROWTH CAPACITY OF MOUSE CARCINOMATA. *(E.)* Rees, J. A. (Dep. Surg., Univ. Bristol, England) and M. Westwood. *Br J Cancer* 29(2):151-157, 1974.

See also:

* (Rev): 4823, 4829, 4857, 4858, 4859, 4860, 4861, 4862
* (Chem): 4916, 4928
* (Phys): 4962, 4963, 4965, 4973
* (Immun): 5097

5304 THE DOCUMENTATION OF HUMAN BREAST CANCER IN TISSUE CULTURE.

(E.) Sherwin, R. P. (Univ. S. California Sch. Med., Los Angeles) and A. Richters. *Cancer* 34(6):1943-1955, 1974.

The usefulness of tissue culture techniques in documenting human breast cancer was investigated. Fifty-three human breast tumors were cultured, and breast cancer documented in 33 (62%) of the cases by establishing architecturally intact forms, spontaneous tissue islands or thin tissue slices. The average culture survival period was two weeks. Cancerous monolayers were observed less often than histocultures, and were best documented by use of photomicrographic time lapse photography of stained cultures. The usefulness of studying human breast cancer histocultures can potentially be applied to clinical diagnosis and therapeutic research with respect to characteristics reflecting intrinsic cancer aggressiveness, quantitation of lymphocyte-macrophage responses, and the testing of therapeutic modalities.

5305 BIOCHEMICAL DIFFERENTIATION OF A MURINE GANGLIONEUROBLASTOMA IN TISSUE CULTURE.

(E.) Ruffner, B. W., Jr. (Div. Med. Oncol., Univ. Virginia, Charlottesville) and M. Smith. *Exp Cell Res* 89(2):442-447, 1974.

The morphology, growth characteristics, acetylcholinesterase (AcChE) activity, response to nerve growth factor (NGF), and *in vivo* tumor-forming characteristics of a tissue culture line derived from a murine ganglioneuroblastoma were studied. The K-119 cell line was established in tissue culture from a spontaneous tumor in a 25-month-old BALB/c breeder mouse. The highly refractile cells had round bodies and developed small processes; their division time was 36 hr. When the cells were grown to high densities, the AcChE activity increased 4-fold over the activity present during the period of maximum growth rate; it was not affected by incubation with NGF. The K-119 cell line was similar to the C-1300 murine neuroblastoma cell line in that the morphologic appearance *in vitro* did not correlate with the appearance *in vivo*; both tumors retained the ability to differentiate under appropriate conditions, and their biochemical differentiation could be expressed independently of their morphology. The K-119 cells did not form tumors when inoculated s.c. into BALB/c mice. This cell line provides an alternate to the C-1300 animal model and may help to determine whether the characteristics of the latter are unique to it or can be expected in other murine tumors of neural origin.

5306 BIOLOGY OF THE HUMAN MALIGNANT LYMPHOMAS. I. ESTABLISHMENT IN CONTINUOUS CELL CULTURE AND HETEROTRANSPLANTATION OF DIFFUSE HISTIOCYTIC LYMPHOMAS.

(E.) Epstein, A. L. (Stanford Univ. Sch. Med., Calif.) and H. S. Kaplan. *Cancer* 34(6):1851-1872, 1974.

Continuous culture *in vitro* and the successful intracerebral heterotransplantation in the nude mouse of cells from malignant pleural or peritoneal effusions of three patients (two men, one woman) with diffuse histiocytic lymphoma was demonstrated. The SU-DHL-1 cell line consisted of two distinct cell populations: the mesothelial cells with abundant cytoplasm and uniform round or oval nuclei and the lymphoma cells, which were considerably larger and had large, hyperchromatic nuclei and distinctive cytoplasmic vacuoles. Cell lines SU-SHL-2 and SU-DHL-3 tended to grow in clumps rather than as single cells and required a 10% supplement of human pleural effusion fluid or 10% human serum for continuous growth. Lymphoma culture cells of SU-DHL-1 were morphologically identical to those in the original pleural effusion. Cells in SU-DHL-2 tended to be multinuclear while cells in the original pleural effusion were either mono- or binucleate. Cells of SU-DHL-2 were predominantly mononuclear with multiple and prominent nucleoli. Electron microscopy showed considerable similarity in ultrastructural appearances of the cultured cells and those from the original lymph node biopsies. SU-DHL-1 was the most highly aneuploid of the cell lines with most cells in the triploid or hypotetraploid range and a modal number of 83 chromosomes. SU-DHL-2 cell line had mostly hyperdiploid cells with a modal number of 51 chromosomes, while the SU-DHL-3 line was hypodiploid with a modal number of 45 chromosomes. Four mice administered intracranial injections of SU-DHL-1 and SU-DHL-3 cells had extensive growth of neoplastic cells in the meninges and brain at autopsy; chromosome preparations confirmed the cells were of human origin. The SU-LB-1 lymphoblastoid cell line carried surface immunoglobulins and was monoclonal for IgM; histiocytic lymphoma cell lines were completely negative for the presence of surface immunoglobulins. These cell lines are an important resource for investigations of the biology of human malignant lymphomas and for research in therapy.

5307 CHARACTERIZATION OF A CELL LINE FROM HUMAN TRANSITIONAL CELL CANCER OF THE URINARY TRACT.

(E.) Elliott, A. Y. (Dep. Urol. Surg., Univ. Minnesota Health Sci. Cent., Minneapolis), P. Cleveland, J. Cervenka, A. E. Castro, N. Stein, T. R. Hakala and E. E. Fraley. *J Natl Cancer Inst* 53(5):1341-1349, 1974.

A cell line was established from a retroperitoneal lymph node which contained metastatic transitional cell carcinoma of the urinary tract; the node was removed from a 53 yr old man with a two yr history of multiple invasive transitional cell neoplasms of both renal pelves, both ureters, and the urinary bladder. The 253J cells lacked contact inhibition and multilayering occurred if cells were not subcultured when they reached a monolayer; individual cells were small with an average diameter of 10 μ. Electron microscopy revealed cells with highly indented nuclei with a small amount of chromatin and multiple large nucleoli; 5-10% of the cells contained phagosomes which frequently contained electron-dense virus-like particles of 30-130 nm in diameter. Most virus-like particles had moderately electron-dense nucleoids surrounded by a trilaminar envelope while about 5% of the particles had the nucleoid set apart from the unit membrane. The surgical specimen of the

253J tumor contained both types of particles, but there were no particles in the nontumorous kidney. These particles were not detected in the study of seven normal human kidneys or 16 human renal adenocarcinomas. The tumor was successfully transplanted into hamsters. Cloned cells in agar showed the same morphology and growth characteristics of 253J cells passaged continuously in liquid medium. Chromosome analysis showed that a clear stem-line had been established with a modal chromosome number of 66-67. If the particles present in 253J are virus, the method by which they mature is not known.

5308 GROWTH BEHAVIOR, CONTACT, AND SURFACE STRUCTURE OF CELLS. *(E.)* Hakomori, S. (Sch. Public Health Med., Univ. Washington, Seattle), C. G. Gahmberg, R. Laine and S. Kijimoto. *Cold Spring Harbor Conf Cell Proliferation* 1:461-471, 1974.

Growth behavior, contact and surface structure of cells were investigated to determine whether any behavioral changes of cells are accompanied by change of surface structure with regard to glycolipid or glycoproteins. The density-dependent chemical quantity of gangliosides was investigated, and actively growing sparse 3T3 cells, sparse but quiescent cells, and confluent contact-inhibited cells were compared. The ganglioside pattern (especially the presence or absence of disialoganglioside) depended on cell density. Sparse quiescent cells showed an identical pattern to sparse growing cells, but were quite distinctive from confluent cells. This finding suggests that change of ganglioside or glycolipids in general requires cell to cell contact, but is not simply induced by lower serum concentration. Whereas the net synthesis of Forssman hapten glycolipids is enhanced in contact inhibited NIL cells, particularly at the early stage of contact inhibition, the surface reactivity of cells to anti-Forssman glycolipid antiserum is significantly decreased when they are contact inhibited. Forssman reactivity of NIL cells greatly decreased at confluency, although net synthesis and the amount of Forssman hapten increased. The density-dependent decrease of cell reactivity to anti-Forssman antibody was not observed when the cells were treated with ethylenediaminetetraacetic acid. Surface labelling patterns with galactose oxidase and tritiated sodium borohydride were compared, followed by gel electrophoresis and thin layer chromatography. The relation of carbohydrate structure to their label and the effect of cell contact on degree of labeling were clearly seen in the labeling pattern of glycolipids. As expected neutral glycolipids of NIL cells were strongly labeled. The label in higher glycolipids, such as globoside or Forssman glycolipids, decreased, and the proportion of label in simpler glycolipids greatly increased in PyNIL cells. It is suggested that structural changes detectable by surface labeling may induce changes in membrane conformation and significantly alter the membrane-bound enzyme system, which affects the level of intracellular activity of enzymes regulating cell growth. Tumor cells are characterized by frozen membrane motility, showing no obvious changes in membrane structure during the cell cycle.

5309 CELLULAR HETEROGENEITY OF CANCERS. *(E.)* Pierce, G. B. (Univ. Colorado Med. Sch., Denver). *Biochem Dis* 4(Part B):463-472, 1974.

A squamous cell carcinoma was chemically induced in an Irish rat to determine if cancer cells can differentiate into benign as well as tumorous cells. The tumor was composed of large masses of undifferentiated cells surrounding so-called squamous "pearls" which were composed of well-differentiated squamous cells each with a central nidus of keratin. A pulse of tritium-labeled thymidine was administered to hosts to identify cells synthesizing DNA. Many of the cells in the undifferentiated portion of the tumor were synthesizing DNA while those of the pearls were not. When an interval of 96 hr was allowed to elapse after the administration of the pulse, many labeled cells were found in the pearls. The experiments were repeated using autoradiography with the electron microscope. The cells outside of the pearls were extremely undifferentiated, lacking the ultrastructural appearance of squamous cells. Their cytoplasm contained the organelles for the production of cell cytoplasm. The labeled cells that had migrated into the pearls were well-differentiated squamous cells with desmosomes and tonofibrils, numerous profiles of rough endoplasmic reticulum, membrane-lining granules, and a paucity of polysomes. It is suspected that the cells were benign because of their histologic appearance and inability to incorporate tritium-labeled thymidine and it is concluded that a squamous cell carcinoma was a caricature of tissue genesis and that the squamous cells observed in the pearls, although derived from malignant cells, were benign. The cellular heterogeneity of this tumor was a reflection of the ability of various stem lines to differentiate.

5310 THE ORIGINS OF STROMAL REACTION IN BREAST CARCINOMA. *(E.)* Shivas, A. A. (Dep. Pathol., Univ. Edinburgh, Scotland) and A. Mackenzie. *J R Coll Surg Edinb* 19(6):345-350, 1974.

The origins of the stromal reaction in breast cancer was studied via electron microscopic examination of tissue obtained from six typical scirrhous carcinomas of the breast. In all six tumors, there was a complete absence of both the formed elements and the cells of normal connective tissue. The typical "scirrhous reaction" was an ill-organized heterogenous assortment of elastic fibers, collagen fibrils, and intermediate matrices, often merging with the cytoplasm of the tumor cells and evidently deriving from them. Lack of differentiation as shown by light microscopy was correlated with the disorganized miscellany of connective tissue elements at the ultrastructural level. The ultrastructural evidence supports the conclusion that the "stromal reaction" in scirrhous carcinoma of the breast is a product of the tumor cells, there being no evidence that normal connective tissue contributes to the reaction. This process differs from that of elastosis only with regard to the generally greater proportion of collagen found in the intracellular material; thus it may also be interpreted as an anomalous morphological function of tumor cells.

5311 GLYCOLIPIDS OF NIL HAMSTER CELLS AS A FUNCTION OF CELL DENSITY AND CELL CYCLE.

(E.) Critchley, D. R. (Imp. Cancer Res. Fund, London, England), K. A. Chandrabose, J. M. Graham and I. Macpherson. *Cold Spring Harbor Conf Cell Proliferation* 1:481-493, 1974.

The density dependent glycolipids of NIL Syrian hamster cells were investigated to determine their possible role in growth regulation. The glycolipids were extracted and separated by thin layer chromatography. NIL8 hamster cells contain five neutral glycolipids from a ceramide mono- to pentahexoside and only one ganglioside, sialyldihexosyl ceramide. Incorporation of [1-^{14}C]palmitate showed that levels of the ceramide tri-, tetra- and pentahexoside increase at high cell density in normal cells but are virtually absent from virus-transformed derivatives. In contrast, incorporation into hematoside was not grossly affected either by cell density or transformation. A study of the kinetics of the density dependence indicates that it is not just a difference of dividing compared to nondividing cells. Thus incorporation into ceramide trihexoside increases while the cells are still dividing logarithmically, although the major increase in labeling of the tetra- and pentahexoside occurs somewhat later when cell growth is reaching a plateau. A suggested conclusion is that the levels of these compounds increase because of increased cell contact.

5312 INTERRELATIONSHIPS OF GLYCOLYSIS, SUGAR TRANSPORT AND THE INITIATION OF DNA SYNTHESIS IN CHICK EMBRYO CELLS.

(E.) Rubin, H. (Dep. Mol. Biol., Univ. California, Berkeley) and D. Fodge. *Cold Spring Harbor Conf Cell Proliferation* 1:801-816, 1974.

In order to identify the primary cellular process which responds to external changes and produces effects on both sugar transport and DNA synthesis, the latter was lowered by incubating chick embryo cells in serum-free medium at pH 6.8 for 16 hr; initiation of synthesis was stimulated by restoring serum at pH 7.6. Following stimulation the incorporation of ^{3}H-thymidine into DNA increased 7-fold by five hr and continued to increase for 19 hr. Removal of essential amino acids completely blocked initiation of DNA synthesis. Although no short-term requirement for external glucose could be reproducibly demonstrated, inhibitors of glycolysis completed blocked the initiation of DNA synthesis. The inhibition by 2-deoxyglucose was reversible but not that by NaF or iodoacetic acid; the effects of these agents on ongoing DNA synthesis were minimal. Protein synthesis was not required for the early stages of stimulation of sugar uptake but was required for later stages of increase. NaF inhibited both 2-deoxyglucose uptake and initiation of DNA synthesis at the same concentration. At low concentrations, 2-deoxyglucose and iodoacetic acid inhibited only the initiation of DNA synthesis, but at higher concentrations inhibited both processes. Experiments with chick embryo cells infected with the Schmidt-Ruppin strain of Rous sarcoma virus revealed a 5.5-fold increase in phosphofructokinase activity at 22 hr after infection and 25-fold activation at 36 hr. By 44 hr the glucose was depleted from the medium of the infected cultures and both phosphofructokinase activity and DNA synthesis had decreased to control levels. The activation of phosphofructokinase could provide the mechanism for the increased glycolysis observed in tumors and correlated with their growth rate. The fluctuating stores of glycogen present in cultured cells may explain why glucose catabolism is essential to the initiation of DNA synthesis in the absence of a requirement for external glucose. Glycogen would provide an alternate source of substrate for glycolysis, independent of the external supply over a short period.

5313 CONTROL OF NORMAL DIFFERENTIATION OF MYELOID LEUKEMIC CELLS. V. NORMAL DIFFERENTIATION IN ANEUPLOID LEUKEMIC CELLS AND THE CHROMOSOME BANDING PATTERN OF D^+ AND D^- CLONES.

(E.) Hayashi, M. (Dep. Genet., Weizmann Inst. Sci., Rehovoth, Israel), E. Fibach and L. Sachs. *Int J Cancer* 14(1):40-48, 1974.

The segration of a suspension culture of myeloid mouse leukemic cells into non-differentiated and differentiated (mature macrophage and granulocytes) clones was studied. The differentiated clones (D^+) were obtained by treating leukemic cells with a protein factor, those failing to respond to the protein being the D^- clone. Further cloning of D^+ and D^- cells resulted in reversion of some to D^- and D^+ and these revertant clones were more unstable in differentiating ability than the parent clones. Karyotyping of stable and unstable clone revealed aneuploidy (chromosome numbers ranging from 39-41) and banding patterns of stable D^+ differed from stable D^- clones. Banding patterns of unstable and stable D^+ clones or D^- clones were the same. The results showed that a proportion of these aneuploid leukemic cells retained the ability to differentiate under suitable conditions. Secondly, karyotypic changes, as revealed by band patterns, were associated with a stable inherited change whereas the unstable, revertant type of change was not associated with alterations in banding patterning. The results indicate that certain leukemic cells are still capable of differentiation even when they have developed aneuploidy.

5314 REGULATION OF HEMOPOIETIC STEM CELL DIFFERENTATION AND PROLIFERATION BY HEMOPOIETIC INDUCTIVE MICROENVIRONMENTS.

(E.) Trentin, J. J. (Baylor Coll. Med., Houston, Tex.), J. M. Rauchwerger and M. T. Gallagher. *Cold Spring Harbor Conf Cell Proliferation* 1:927-932, 1974.

Spleen and bone marrow hemopoietic colony studies in lethally irradiated mice transfused with limited numbers of bone marrow cells have revealed that the direction of differentiation of pluripotent stem cells is controlled by their interaction with hematopoietic inductive microenvironments (HIM) of the spleen and bone marrow. The four types of HIM are erythroid, neutrophilic granuloid, eosinophilic granuloid, and megakaryocytic. Erythoid HIM predominate in the spleen and granuloid HIM in the bone marrow. The mechanism of the granuloid HIM is still obscure, but several early studies indicated that the role of the erythroid HIM is to induce pluripotent stem cells to become erythropoietin-sensitive stem cells. Recent experiments confirming this concept are reviewed. Lethally irridated Steel anemic mice had greatly reduced numbers of spleen and bone marrow erythroid colonies compared with their normal littermates. The colonies were not replaced by small unidifferentiated colonies of erythropoitensensitive stem cells, as they were in irradiated, marrow-transfused mice of normal strains. In addition to supporting the concept of erythroid HIM function, this study demonstrated that Steel anemia is caused by a lack of functional erythroid HIM. Xenogeneic (rat to mouse) bone marrow transplantations were also performed. Control isologous mouse marrow transfused into lethally irradiated mice gave erthroid, granuloid, and megakaryocytic types of spleen colonies. Control isologous rat marrow transfused into lethally irradiated rats gave rise only to erythroid and undifferentiated colonies. When rat marrow was transfused into lethally irradiated mice, both erythroid and granuloid colonies were formed. These results indicate that mouse HIM can induce rat pluripotent stem cells to differentiate along lines seen in the mouse spleen but not encountered in the rat spleen.

5315 STUDY OF SOME OF THE FACTORS INFLUENCING THE PROLIFERATION AND DIFFERENTIATION OF THE MULTIPOTENTIAL HEMOPOETIC STEM CELLS. *(E.)*

Tubiana, M. (Inst. Radiobiol. Clin., Inst. Gustave-Roussy, Villejuif, France), E. Frindel, H. Croizat and F. Vassort. *Cold Spring Harbor Conf Cell Proliferation* 1:933-944, 1974.

Some of the factors that influence the proliferation and differentiation of pluripotential stem cells are discussed in light of recent experimental data. Three sets of experiments are reviewed in which the proliferative status of the stem cells of mouse bone marrow was studied after selective killing of maturing hemopoietic cells, partial body irradiation, and antigenic stimulation. The first set of experiments provides data on the feedback mechanism between the differentiated cells and the stem cells. These experiments were conducted on C3H mice in which 20% of the CFU's were in cycle. The injection of 1 mCi [^{3}H]thymidine had no killing effect on the CFU's but selectively killed cells in S in the differentiated compartment. These experiments seem to indicate that it is the damage to the compartment of differentiated cells that causes a differentiation of stem cells. The signal that effects differentiation of CFU's also either triggers simultaneously proliferation or provokes indirectly a recruitment into cycle of quiescent cells due to the depletion of the CFU compartment caused by differentiation. Partial body irradiation with mice demonstrated the importance of an abscopal effect that induces mainly a differentiation of CFU's and also a temporary increase of CFU proliferation. This feedback mechanism is triggered less than 15 min after irradiation. The study of antigenic stimulation illustrates the complexity of some regulatory mechanisms. It seems that thymectomy does not interfere with the CFU regulating mechanisms related to the erythropoietic or granulocytic series, but that thymus is involved in the CFU regulatory mechanism of at least some of the immunocompetent cells and in the differentiation of CFU's toward antigen responsive cells. Most of the CFU proliferation observed in C3H mice is normally related to proliferation of the lymphocytic series.

5316 PROLIFERATION OF HAEMOPOIETIC STEM CELLS *IN VITRO*. *(E.)*

Dexter, T. M. (Christie Hosp. Holt Radium Inst., Manchester, England) and L. G. Lajtha. *Br J Haematol* 28(4):525-530, 1974.

The culture of non-attaching spleen colony forming cells (CFUs) in a liquid system is described in which granulocyte and mononuclear cell proliferation continues for several weeks. Nucleated thymus cells obtained from BDF$_1$ mice were assayed weekly for non-attaching cells. After two weeks, the suspended cells in 1/2 of the cultures consisted mainly of mononuclear and atypical granulocytic cells (M-cultures), whereas in the others they were classical granulocytes (G-cultures). After three weeks in culture, CFUs were not detectable in M-cultures. High numbers of CFUs could be detected in G-cultures for ten weeks. Grafts of the M-cultured cells after three weeks *in vitro* did not protect lethally irradiated mice from hemopoietic death, but grafts from the G-cultures gave protection after seven and nine weeks. The maintenance of hemopoietic stem cells in culture for extended periods of time is hypothesized to be due to changes in culture conditions or to an inherent incapacity of the stem cell to proliferate.

5317 BIOLOGICAL ACTIVITY OF A GROWTH FACTOR FOR OVARIAN CELLS. *(E.)*

Jones, K. L. (Dep. Pediatr., Univ. California, San Diego) and D. Gospodarowicz. *Proc Natl Acad Sci USA* 71(9):3372-3376, 1974.

The effect of a growth-stimulating substance isolated from bovine pituitary glands was studied in ovarian rat cells. Pituitary fractions were purified by chromatography and their relative activities tested by comparing cell counts and plating efficiencies. The fractions were tested at 1 μg/ml of final medium concentrations on 50-100 cells and incubated for ten days. Plating efficiencies were recorded for the following fractions: crude extract (3.5%), 2.2 M $(NH_4)SO_2$ precipitate (3.5%), 4.0 M $(NH_4)SO_2$ precipitate (6.5%), carboxymethyl-cellulose fraction 1 (6.0%), carboxymethyl-cellulose fraction 2 (5.0%), carboxymethyl-cellulose fraction 3 (6.0%), carboxymethyl-cellulose fraction 4 (43%). Separation of fraction 4 into two fractions by further chromatography yielded fraction 5 which showed greater activity (10-15 fold) over concentrations ranging from 0.01 to 1.0 μg/ml and demonstrated the concentration dependence of the factor. The use of chick fibroblasts as a test system failed to yield growth stimulation effects. Exact identification of the factor is not clear at this time. Previous studies have shown that the substance is not a known anterior pituitary hormone and does not cross-react with a factor produced by rat liver cells.

5318 FACTORS INFLUENCING THE DYNAMIC DISPLAY OF LECTIN BINDING SITES ON NORMAL AND TRANSFORMED CELL SURFACES. *(E.)* Nicolson, G. L. (Salk Inst. Biol. Studies, San Diego, Calif.). *Cold Spring Harbor Conf Cell Proliferation* 1:251-270, 1974.

The behavior of lectin sites on normal and transformed cells was investigated with ^{125}I-labeled concanavalin A (ConA), *R. communis* agglutinin and fluorescent-labeled antibodies against these lectins. ConA- or *R. communis*-mediated agglutinability of murine 3T3 cells and their Simian virus 40-transformed derivatives (SV3T3) decreased at cell confluency. The number of ConA binding sites was independent of cell culture density; the number of *R. communis* binding sites on 3T3 cells increased 2.5 times at cell-to-cell contact, but remained constant on SV3T3 cells and also on spontaneously transformed 3T12 cells. The distribution and mobility of *R. communis* sites on 3T3 and SV3T3 cells were investigated by labeling unfixed and aldehyde-fixed cells at 0 C, incubating the agglutinin-labeled cells at various temperatures, and then labeling with fluorescent anti-*R. communis* agglutinin. Unfixed or fixed cells labeled at 0 C and incubated at 0 C showed uniform fluoresence, indicating that an inherently dispersed distribution of lectin binding sites exists on the cell surface. Unfixed SV3T3, but not 3T3, cells treated with low *R. communis* agglutinin concentrations (1-2 μg/ml, 0 C) and then incubated at 37 C for ten min prior to fluorescent labeling showed patchy fluorescence. This indicates greater mobility of *R. communis* sites on the transformed cell surface. Use of fixed cells or high lectin concentrations (50 μg/ml, 0 C) prevented the lectin-induced redistribution of fluorescence from uniform to patchy on SV3T3 cells. Since both 3T3 and SV3T3 cells are agglutinable when treated with 50 μg/ml *R. communis* agglutinin and both types of cells show inherently uniform lectin binding site distribution, lectin-induced redistribution or clustering of lectin binding sites, *per se*, is not essential for cell agglutination. At low lectin concentrations, where only a few lectin binding sites are occupied, lateral rearrangments may be necessary to increase local densities of cell-surface bound lectin molecules so that multiple cross-bridges can form between adjacent cells. The involvement of clustered lectin sites in cell agglutination was demonstrated by agglutinating SV3T3 cells with ferritin-conjugated ConA. Differences in the lectin-mediated agglutinability of SV3T3 and 3T3 cells are discussed with respect to nature of the lectin molecule, total number of lectin binding sites and the number of sites occupied, mobility of lectin binding sites and ability of the sites to be clustered, interference of cell surface structures, cell charge repulsive forces, cell membrane rigidity, and peripheral transmembrane restraints on molecules bearing lectin binding sites.

5319 THE TRANSFORMED CELL SURFACE: AN ANALYSIS OF THE INCREASED LECTIN AGGLUTINABILITY AND THE CONCEPT OF GROWTH CONTROL BY SURFACE PROTEASES. *(E.)* Talmadge, K. W. (Biocent., Univ. Basel, Switzerland), K. D. Noonan and M. M. Burger. *Cold Spring Harbor Conf Cell Proliferation* 1:313-325, 1974.

Theories of lectin-mediated agglutination of virus-transformed cells are reviewed and experimental data are presented on the relevance of receptor site mobility and membrane proteolytic activity for the agglutination process. Treatment with glutaraldehyde prevented the agglutinability of polyoma virus-transformed 3T3 cells (Py3T3) but did not interfere with lectin binding. Temperature-dependence studies for agglutination by concanavalin A indicated that agglutination does not occur below the freezing point for lipids. While suggesting that agglutination may require some freedom of mobility, these results did not demonstrate whether increased agglutinability in transformed cells is caused by an increased mobility of macromolecules within the membrane. The effect of mild protease treatment of untransformed mouse and chicken fibroblasts suggested that a proteolytic activity associated with the surface membrane of transformed cells might be important in the release from growth control. Protease treatment led to a transient agglutinability of the untransformed cells and a transient release from density-dependent inhibition of growth. Studies of the interaction of Py3T3 cells and the protease inhibitor ovomucoid revealed that cell growth was significantly inhibited by polyacrylamide bead-coupled ovomucoid containing 100-420 μg protein/10^6 beads. In the presence of the ovomucoid bead the Py3T3 cells stopped growing at a density of 2 x 10^5 cells/cm^2. The growth inhibition did not involve uptake of ovomucoid and was apparently related to a critical event in the plasma membrane. A hypothetical cascading system of membrane-attached proteases is presented. The system may explain how different treatments of cell cultures all lead to growth promotion and how activated proteases trigger increased agglutinability.

5320 GROWTH INHIBITION OF TUMOR CELLS BY PROTEASE INHIBITORS: CONSIDERATION OF THE MECHANISMS INVOLVED. *(E.)* Schnebli, H. P. (Friedrich Miescher-Inst., Basel, Switzerland). *Cold Spring Harbor Conf Cell Proliferation* 1:327-337, 1974.

The cellular targets of the protease inhibitors and their ability to restore contact inhibition in transformed cells were investigated with 3T3 mouse fibroblasts and their polyoma- and SV40-transformed (Py3T3, SV3T3) derivative cells. Cells were broken by freeze thawing and cell numbers were determined in parallel cultures in order to calculate the incorporation on a per cell basis. Both the cells and the sera used in media were able to split *N*-α-tosyl-L-arginine methylester at a measurable rate. The protease hydrolase activity and the growth supporting capacity of sera were not related. The saturation densities of 3T3 or SV3T3 cells were not affected when the *N*-α-tosyl-L-arginine methylester hydrolase in serum was eliminated by either heat inactivation or treatment with *N*-α-tosyl-L-chloromethane. Conditioning of sera on either 3T3 or SV3T3 cells did not increase their hydrolase activity, indicating that the cells neither excrete *N*-α-tosyl-L-arginine methylester hydrolases nor activate serum enzymes. 3T3, SV3T3 and Py3T3 cells did not differ significantly when compared with respect to the rapid phase in intact cells or particulate fractions, nor with respect to the slow reaction of the particulate or the soluble enzyme. The effect of protease inhibitors on the rapid phase activity in the particulate from SV3T3 was investigated. This activity appeared to be inactivated by the substrate *N*-α-tosyl-L-arginine methylester and was sensitive to *N*-α-tosyl-L-chloromethane and *N*-α-tosyl-L-phenylalanyl-chloromethane but not to ovomucoid. The protease inhibitors restore several criteria for contact inhibition in transformed cells. They reduce the saturation density and the agglutinability by lectins and induce flat morphology, but they fail to arrest the cells in the G_1 phase. It is doubtful that contact inhibition is truly restored by the inhibitors.

5321 SERUM FACTORS AND GROWTH CONTROL. *(E.)* Holley, R. W. (Salk Inst., San Diego, Calif.). *Cold Spring Harbor Conf Cell Proliferation* 1: 13-18, 1974.

Experiments are summarized which support the hypotheses that contact inhibition of growth is better described as density-dependent regulation of growth; that growth control of mammalian cells involves the interaction of many factors; and that changes in the cell membrane are probably responsible for malignant growth. The density-dependent growth of 3T3 cells is related to the high serum requirements of these cells; neither contacts between cells nor inhibitors play a significant role in controlling growth of 3T3 cells. Factors known to control growth of mammalian cells in culture are low-molecular weight nutrients; serum factors that, resp., stimulate uptake of nutrients, affect cyclic AMP levels, or affect spreading and movement; and serum factors with unknown functions. Studies of growth control in temperature-sensitive Simian virus-transformed 3T3 cells and polyoma virus-transformed BHK cells suggest that membrane changes are involved in the changes in growth control that accompany temperature shifts. Both transformed lines ordinarily show restricted growth at 39 C; however, the former continues to grow at this temperature if the medium is supplemented with a serum fraction that initiates DNA synthesis in quiescent 3T3 cells, while the latter line continues to grow if the medium is supplemented with biotin and iron. Preliminary results with the mouse myeloma line XS63-5 confirm previous findings of internal mechanisms for arrest of growth in tumor cells. Arrest of XS63-5 cells in G_1 (G_0) takes place when a low-molecular weight serum factor becomes limiting in the medium. Addition of fresh serum to quiescent tumor cells leads to initiation of DNA synthesis after 18 hr. These data demonstrate the important role of serum factors in control of mammalian cell growth.

5322 INITIATION OF DIVISION OF DENSITY-INHIBITED FIBROBLASTS BY GLUCOCORTICOIDS. *(E.)* Cunningham, D. D. (Coll. Med., Univ. California, Irvine), C. R. Thrash and R. D. Glynn. *Cold Spring Harbor Conf Cell Proliferation* 1:105-113, 1974.

Studies of the effect of cortisol on fibroblast division are reported. In density-inhibited 3T3 cells, cortisol (14 μM) produced an 85% increase in cell number in four days. A similar cortisol-induced initiation of division occurred in early passage human diploid foreskin fibroblasts, demonstrating that the effect was not unique to the 3T3 line. Treatment of density-inhibited 3T3 cells with cortisol also resulted in a marked increase in DNA synthesis, which peaked at 24 hr. Maximum stimulation was observed at concentrations from 0.5-28 μM. Cortisol had little effect on DNA synthesis or division of spontaneously transformed or polyoma- or Simian virus 40-transformed fibroblasts. Transformed fibroblasts remained unresponsive to cortisol even when their growth was greatly slowed by placing them in medium containing 0.1% serum. The initiation of DNA synthesis by cortisol in density-inhibited fibroblasts was specific in terms of the steroid added since only steroids with glucocorticoid activity (cortisol, corticosterone, dexamethasone, triamcinolone acetonide) brought about the response. Surface change measured by increased concanavalin A agglutinability was not in itself sufficient to initiate cell division. The selective initiation observed with glucocorticoids should facilitate studies on events leading to cell proliferation. Possibilities that might account for the lack of a stimulatory effect of cortisol on slowly growing transformed 3T3 cells are briefly summarized.

5323 EXPERIMENTAL APPROACHES TO PROBLEMS IN CARCINOGENESIS. *(E.)* Bendich, A. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.), E. Borenfreund, P. J. Higgins, S. S. Sternberg and E. H. Stonehill. *Biochem Dis* 4(Part B):515-530, 1974.

Cell to cell interactions were investigated in experiments on the effects of DNA on mammalian cells and the effect of dimethylsulfoxide (DMSO) and dimethylformamide (DMF) on various malignant cell lines. Living sperm, collected aseptically from mouse epididymi and vas deferens, were added to cultures of various nontumor and tumor cell lines. Apparent penetration occurred with cells of all the lines as judged by light microscopy. When sperm were mixed in equal numbers with suspended Chinese hamster (CH) cells, penetration of many of the cells could be seen within the first few hours by light microscopy and scanning and transmission electron microscopy. When sperm that had been labeled *in vivo* with [^{3}H] thymidine were used, autoradiography revealed DNA uptake in nuclei of CH cells after three days of coculture, suggesting release of DNA after penetration. In another experiment, the addition of DMSO or DMF to cultures of tumor cells induced them to grow in patterns that were much more characteristic of normal than of tumor cells. In the absence of the agents, the cells grew in disarray, moved over one another, and piled up, forming colonies several cells thick. When the medium was supplemented for at least three days with 1-2% DMSO or 0.5 to 1% DMF, the cells grew in a regular parallel pattern, showing contact inhibition. When the agents were removed from the media, the growth pattern reverted to the old one after 3 days. The process can be repeatedly turned on or off by simply adding or withholding DMSO or DMF. The results show that chemicals as simple as DMSO can inhibit tumorigenic expression reversibly. This finding has bearing on arguments dealing with the origin and nature of carcinogenesis.

5324 TISSUE CULTURE STUDY ON NEUROBLASTOMA. *(E.)* Kobayashi, N. (Dep. Pediatr., Univ. Tokyo, Japan), S. Egi and K. Ohmi. *Maandschr Kindergeneeskd* 42(11/12):479-484, 1974.

Tissue slices from four neuroblastomas were incubated with 4-^{14}C-hydrocortisone for four hr; steroids were then extracted and the extract subjected to paper chromatography and scanning by a gas-flow stripcounter. In addition to the peak representing added hydrocortisone, another distinct peak with the same mobility as cortisone was observed in all four cases. UV absorption confirmed that this substance was cortisone. In the one case studied, addition of unlabeled cortisone to the tissue incubate suppressed conversion of labeled hydrocortisone to cortisone. This indicated that in neuroblastoma tissue there is also a metabolic pathway of conversion from cortisone to hydrocortisone. If this mechanism is operative *in vivo*, endocrinological disturbances might be expected in patients with neuroblastoma. Cultured tumor cells were treated with various concentrations of chemotherapeutic agents to determine minimal effective concentrations for *in vivo* cytotoxic effects. Vincristine had a rather constant effective minimal concentration compared with cyclophosphamide or actinomycin D. Five patients were effectively treated by vincristine and cyclophosphamide and one patient showed temporary improvement. This combination therapy method can be used to evaluate drug sensitivity of tumor cells.

5325 THYMUS-HISTONE TREATED BHK21 CELLS; MALIGNANT CHARACTERISTICS *IN VITRO* BUT REDUCED TUMORIGENICITY. *(E.)* Latner, A. L. (R. Victoria Infirm., Newcastle upon Tyne, England), G. A. Turner and E. Longstaff. *Eur J Cancer* 10(9):601-609, 1974.

The isolation and characteristics of thymus-histone-treated cells were studied in confluent monolayer cultures of BHK21 cells incubated with bullock thymus histones (25-100 μg/ml). After return of the cells to growth medium, two types of cells developed: one was identical to that produced by untreated BHK21 cells; the other (BHK21/C13/HT) showed a transformed morphology similar to that obtained after treatment of BHK21 cells with polyoma virus. The transformed cultures showed a complete breakdown in contact inhibition and extensive multilayering; giant multinucleate cells were present. Cytotoxicity increased and plating efficiency and the percentage transformation increased nonlinearly with increasing histone concentration. Unlike BHK21 cells, the HT cells grew vigorously in medium containing 2% calf serum and in medium containing 0.3% semi-solid agar. A polyoma-transformed derivative of BHK21 showed similar growth characteristics in these media. When grown in mixed culture with BHK21 cells, the HT cells did not show a large increase in number until after 33 generations. The plating efficiency of the HT cells was greater than that of the BHK21 cells and similar to that of polyoma-transformed BHK21 cells. BHK21 and polyoma-transformed BHK21 cells injected s.c. into hamsters produced solid tumors. HT cells induced a much lower incidence of tumors, which were very soft and hemorrhagic with numerous reticuloendothelial cells. The data indicate that the appearance of HT cells after treatment of BHK21 cells with histones was due to transformation, not to selection.

5326 STUDIES ON POLYSOME-MEMBRANE INTERACTIONS IN MOUSE MYELOMA CELLS. *(E.)* Harrison, T. M. (Med. Res. Counc. Lab. Mol. Biol., Cambridge, England), G. G. Brownlee and C. Milstein. *Eur J Biochem* 47(3):613-620, 1974.

The attachment of membrane-bound ribosomes to the endoplasmic reticulum was investigated in cultured MOPC 21 mouse plasmacytoma cells, and a process for the dissociation of bound polysomes was developed. Detachment of 40-45% of the bound ribosomes was accomplished using 500 mM KCl. This fraction was designated as "loose" and was predominately monosomal. The remaining fraction was designated as "tight" and was polysomal. Both fractions were found to contain immunoglobulin light-chain mRNA. Membrane bound polysomes were dissociated into subunits in two steps Incubation of membrane-bound polysomes with puromycin partially released the polysomes from the membrane. Ribosomal elements not released by puromycin sedimented at 60 S and could be detached by 500 mM KCl. Total release of polysomes from the endoplasmic reticulum was accomplished by combining both processes. The results indicate that a functional distinction between the loose and tight polysomes is improbable, as they both contain the same mRNA. Also, the tightly bound polysomal fraction is most likely anchored to the membrane by the developing polypeptid chains, whereas the loosely bound fraction is held by salt-labile forces.

5327 INCORPORATION OF PRECURSORS AND INHIBITORS OF NUCLEIC ACID SYNTHESIS INTO HEPATOMAS AND LIVER OF THE RAT. *(E.)* Lea, M. A. (New Jersey Med. Sch., Newark), J. Bullock, F. L. Khalil and H. P. Morris. *Cancer Res* 34(12):3414-3420, 1974.

The incorporation of ^{3}H-orotate into the acid-soluble fraction and RNA of hepatomas, and the entry of ^{3}H-orotate into hepatomas and regenerating liver cells was investigated to determine if transport and/or metabolism of orotate might be a limiting factor in liver tumors. Labeled orotate, dihydroorotate, uracil, uridine, thymidine, inorganic phosphate, 5-fluorouracil and hycanthone were injected i.p. or s. c. into partially hepatectomized Sprague-Dawley rats or Buffalo rats injected s.c. with a series of hepatoma tumor cells. Orotate was found to be incorporated into the acid-soluble fractions and RNA of all the hepatomas more slowly than into regenerating liver. Similar studies using labeled dihydroorotate, uracil, uridine, thymidine, inorganic phosphate, 5-fluorouracil and hycanthone showed no such changes in hepatomas, but there was a tendency for these to be taken up more slowly in the more rapidly growing hepatomas. It was concluded that the uptake of orotate into tumor tissues is not solely determined by blood flow (vascular supply) to the tumors. It is suggested that hepatic neoplasms may have impaired transport systems for orotate and that this may be a distinct feature of hepatomas because regenerating liver cells did not show decreased uptake of orotate.

5328 RIBOSOME SYNTHESIS DURING PREPARATION FOR DIVISION IN THE FIBROBLAST. *(E.)* Green,
H. (Massachusetts Inst. Technol., Cambridge). *Cold Spring Harbor Conf Cell Proliferation* 1:743-755, 1974.

The rate of RNA synthesis was measured in fibroblasts in transition from resting to growing state. RNA began to accumulate immediately after addition of 10% serum to confluent cultures of 3T6 cells resting in 0.5% serum; and the RNA content increased by more than 40% in the 15-hr period before DNA accumulation was detected. The 40% increase was mainly due to an increase in the rate of ribosomal RNA synthesis as measured in ghost monolayers. rRNA synthesis increased within ten min of addition of serum to resting cells. The rate increased steadily with time, becoming 2.5-3.5 times higher than the resting rate by time of initiation of DNA synthesis and 3-4.5 times higher by the time of the first cell divisions (about 25 hr). Measurements of the nuclear size of 3T6 cells indicated that rRNA synthesis is a nucleolar function and that the increased rate of synthesis is not dependent on a change in either the size of the rest of the nucleus or in the overall rate of nucleoplasmic transcription. Since 80% of he RNA of the cell is ribosomal, an increase in he total RNA content is a reflection of an increased number of ribosomes. Since the RNA content of the resting cell remains constant, half complement of ribosomes must be resynthesized luring the same period. The author suggests that one of the earliest of all changes taking place n RNA synthesis is an increase in the rate of ibosome synthesis.
role.

329 PHOSPHORYLATION OF PROTEINS OF RIBOSOMES AND NUCLEOLAR PRERIBOSOMAL PARTICLES FROM OVIKOFF HEPATOMA ASCITES CELLS. *(E.)* Olson, M. O.
. (Baylor Coll. Med., Houston, Tex.), A. W. Prestayko, . E. Jones and H. Busch. *J Mol Biol* 80(1):161-168, 974.

he ribosomal and nucleolar preribosomal particle roteins from Novikoff hepatoma ascites cells were tudied to determine the relationship of the phosphoryation processes involved. Novikoff hepatoma ascites ells in male albino rats were labeled *in vivo* two hr ith ^{32}P-orthophosphate, after which the proteins from he cytoplasmic ribosomes and nucleolar preribosomal articles were analyzed by two-dimensional polyacrylaide gel electrophoresis and autoradiography. Five roteins (B2, B3, B6, B32, and B35P) were phosphoryated in the ribosomes, while approximately 19 proeins were phosphorylated in the nucleolar preribosomal particles. Although four of the latter proteins were ribosomal proteins, they differed from the proteins labeled in the ribosomes; the 15 additional phosphorylated nucleolar preribosomal particle proteins were nonribosomal. The results suggest that phosphorylation of the proteins of the nucleolar preribosomal particles is independent of the phosphorylation of the cytoplasmic ribosomal proteins and may be a part of the maturation process of the preribosomal proteins.

5330 PURIFICATION AND PROPERTIES OF THE MAJOR PHENYLALANYL TRANSFER RNA SPECIES IN DRUG-RESISTANT EHRLICH TUMOR CELLS. *(E.)* Hayashi, M.
(Univ. Texas System Cancer Cent., Houston) and A. C. Griffin. *Cancer Res* 34(12):3311-3317, 1974.

Phenylalanyl tRNA species obtained from normal mouse liver and Ehrlich ascites tumor cells resistant to nitrogen mustard (HN2) and sensitive to HN2 were studied in order to gain insight into the mechanism of drug resistance. Reverse-phase chromatography of normal and HN2 sensitive ascites tumor cells produces three peaks designated here as tRNAI, tRNAII and tRNAIII (the predominant species). Separation of tRNA species obtained from HN2 resistant ascites cells revealed similar peaks, but in this case tRNAII was the predominant species and tRNAIII was almost entirely absent. The tRNAIII from normal mouse liver and tRNAII from tumor cells were purified and studied with respect to nucleotide composition, coding properties and aminoacylation kinetics. The Km of tRNAIII was lower than that of tRNAII, whereas the initial reaction velocities were higher in the tRNAIII. Two-dimensional chromatography of borohydride derivatives of the tRNAs revealed that while the major nucleoside compositions were similar, tRNAII from resistant tumor cells contained 3'-methylcytidine and more 5'-methylcytidine and dihydrouracil than tRNAIII from normal mouse liver. Chromatography of RNAase digests suggest that the nucleotide sequences of the two tRNAs is similar from the 3'-terminal to the first guanosine residue.

5331 SHORT-LIVED, SMALL RNAs IN THE CYTOPLASM OF HELA CELLS. *(E.)* Eliceiri, G. L. (St.
Louis Univ. Sch. Med, Mo.). *Cell* 3(1):11-14, 1974.

This study was performed to characterize small, unstable cytoplasmic RNAs found in HeLa cells. The incubation of HeLa S3 cells with ^{3}H-uridine for 30 min, and subsequent electrophoretic separation of extracted RNA resulted in the appearance of two small peaks which migrated at 74% and 86% of the speed of 5S RNA. The half-life of these small RNA molecules was found to be approximately ten min. Treatment of HeLa cells with a low level of actinomycin D (0.04 μg/ml) that inhibits the transcription of rRNA did not suppress the synthesis of the small RNA molecules. Incubation of HeLa cells with 1 μg/ml ethidium bromide (an inhibitor of mitochondrial DNA transcription) had no effect on the synthesis of the small RNA molecules. The small RNA molecules also appear to be methylated when incubated with L-methyl-^{3}H-methionine under conditions in which 5S rRNA is not. It is concluded that the two small molecule RNA species are not related to the other major RNA species in HeLa cells.

5332 THE METHYLATED NUCLEOTIDE SEQUENCES IN HELA CELL RIBOSOMAL RNA AND ITS PRECURSORS. *(E.)* Maden, B. E. H. (Dep. Biochem., Univ. Glasgow, Scotland) and M. Salim. *J Mol Biol* 88(1): 133-164, 1974.

The methylated nucleotide sequences in HeLa cell ribosomal RNA and its precursors were examined by RNA fingerprinting and sequencing methods. 18 S RNA was found to contain approximately 46 methyl groups, 28 S RNA some 70 methyl groups and 5.8 S RNA one methyl group. Most methyl groups occurred in different T_1 ribonuclease oligonucleotides, and most of these were recovered approximately once per molecule of 18 S or 28 S RNA. There were also several multiply-methylated oligonucleotides, a few short products that occurred more than once and a few fractional products. The great majority of methylations occurred at the level of 45 S RNA, but six further methylations occurred late during the maturation of 18 S RNA and one fractional methylation during 28 S maturation. The transcribed spacer regions of the precursor molecules were unmethylated. Chemical analysis of the methylated components and sequences indicated that all except five early methylations were on ribose groups, the remaining five being on bases within the 28 S sequence. The late methylations were all on bases. It is concluded that methylation is mainly confined to the ribosomal sequence of 45 S RNA and that the great majority of the approximately 110 45 S methylations are on regions with different primary sequences.

5333 A TISSUE-SPECIFIC FACTOR INHIBITING DNA SYNTHESIS IN MOUSE EPIDERMIS. *(E.)* Marks, F. (Ger. Cancer Res. Cent., Heidelberg, West Germany). *Natl Cancer Inst Monogr* 38:79-90, 1973.

The purification and biochemical characterization of a tissue-specific factor which inhibits DNA synthesis in mouse epidermis is described. Female NMRI mice were inoculated i.p. with a solution of pig-skin extract or its purified fractions. The back skin was subsequently removed and the subcutaneous tissue scraped from it, after which it was incubated with (methyl-^{3}H)thymidine for 45 min and the epidermal DNA was isolated. For *in vivo* experiments, thymidine was injected i.p. and the back skin was removed 45 min later. I.p. injections of pig-skin extracts caused a pronounced and dose-dependent inhibition of thymidine incorporation into the epidermal DNA. The time course of the effect showed a lag phase of 2-5 hr, maximal inhibition being observed 10 and 20 hr after injection. The pig-skin extract had no significant effect on DNA synthesis in diaphragm, kidney, lung, or adipose tissue, although a transient but pronounced inhibition of spleen DNA was observed. In addition, rat liver, lung, and kidney extracts had no effect on epidermal DNA synthesis. The G_1 inhibitor was inactivated at pH 10, but it was not dialyzable and its activity was unaffected by heating, denaturing agents, and digestion with trypsin, pronase, or RNase. The G_1 inhibitor appeared to be a macromolecule with an apparent molecular weight of more than 10^5 Daltons; it consisted primarily of protein and polysaccharide. By proteolytic digestion, a considerable decrease in the molecular weight of the active fraction could be achieved without any loss of inhibitory activity. The results indicate that the G_1 inhibitor is a glycoprotein consisting of a large protein "coat" which can be removed by proteolytic digestion, and a small active "core", probably a glycopeptide, with a molecular weight of 10,000-20,000 Daltons. During lyophilization, the factor appears to form large aggregates.

5334 ON THE MECHANISM OF DNA REPLICATION IN ISOLATED NUCLEI FROM HELA CELLS. *(E.)* Friedman, D. L. (Dep. Mol. Biol., Vanderbilt Univ., Nashville, Tenn.). *Biochim Biophys Acta* 353(4): 447-462, 1974.

DNA replication was described in S-phase nuclei from HeLa cells. The washed nuclei were suspended in bovine serum albumin in the absence of cytoplasm to reduce clumping and to maintain low levels of thymidine triphosphate (TTP) activity as well as insignificant amounts of ATP. DNA synthesis occured either without ATP, and with TTP at a concentration of 1.5×10^{-5} M; with ATP, with a TTP concentration of 4.5×10^{-5} M; or with ATP (5×10^{-3} M), and TTP at 1.5×10^{-5} M, which stimulates the incorporation rate by 3-fold. Both ATP-dependent and ATP-independent DNA synthesis required all four deoxyribonucleotides. The apparent K_m values for ATP-independent reactions were 5×10^{-7} M and 6×10^{-7} M and for the ATP-dependent reaction the K_m value was 1.3×10^{-6} M. Density labeling showed both continuous and discontinuous synthesis occurring in the presence and absence of ATP. Sedimentation studies revealed that the discontinuous pieces made in the presence of ATP were 8-10 S while those made in the absence of ATP were only 5-6 S. Sedimentation in alkaline sucrose gradients without prior isolation reveals a 40 S piece and an 8-10 S piece. The results indicate that one of the strands of DNA is replicated continuously while the other is replicated discontinuously.

5335 DNA SYNTHESIS BY ALKYLATED CELLS. *(E.)* Scudiero, D. (Dep. Microbiol., Univ. Chicago, Ill.) and B. Strauss. *Biochem Dis 4 (Part A)*:381-400, 1974.

The abnormality which prevents the DNA synthesized by HEp 2 cells treated with the mutagenic alkylating agent methyl methanesulfonate (MMS) from replicating was studied. The DNA synthesized by HEp 2 cells treated with MMS contained regions of single strandedness. This DNA adsorbed to columns of benzoylated naphthoylated DEAE cellulose and was eluted only when the columns were washed with caffeine. The DNA fragments containing single stranded regions were converted to purely double stranded fragments by treatment with exonuclease. The fragments produced by the alkylated cells were qualitatively similar to those produced by the alkylated cells given a pulse of radioactivity, but differed in both their relative number and in the extent of the regions of single strandedness. The single stranded regions from both the control and alkylated cells were gradually converted to purely double stranded DNA although the conversion occurred more slowly in the alkylated cells. It is concluded that these fragments arise in the course of normal DNA synthesis, but that they have a longer lifetime when DNA synthesis is delayed by a MMS-induced lesion. The disappearance of the single stranded regions from the newly synthesized DNA formed by the alkylated cells is probably a reflection of the processes of postreplication repair.

5336 UPTAKE OF T7 DNA BY HAMSTER EMBRYO CELLS IN TISSUE CULTURE. *(E.)* Leavitt, J. C. (Dep. Biochem. Biophys. Sci., Johns Hopkins Univ., Baltimore, Md.), L. M. Schechtman, P. O. P. Ts'o, E. Borenfreund and A. Bendich. *Biochem Dis* 4(Part B):639-659, 1974.

The uptake of exogenous coliphage T7 or its DNA by Syrian Golden hamster embryo cells *in vitro* was studied to determine the mechanism of incorporation, the amount of foreign DNA which can enter the nuclei of recipient cells, and the functional state of the exogenous DNA with regard to its replication and expression within the recipient cell. The tissue cultured hamster cells were pretreated with diethylaminoethyl-dextran and were then exposed either to bacteriophage T7 or its DNA at a multiplicity of about $10^{5.5}$-10^6 per cell. In 3 hr, 10^5 phage genome equivalents were bound per cell regardless of whether the whole virus or its DNA alone was used. Most of the DNA that was bound after short incubation was released from the cells following DNase treatment and on longer incubation (24 hr or longer), 30-50% of the viral DNA became resistant to DNase. As demonstrated by (^{3}H) autoradiography, all of the extracellular T7 DNA was removed by DNase treatment, and 99% of the intracellular viral isotope was localized in the nuclei. After four generations of cell growth (71 hr), the intracellular viral isotopes were shown to have a high molecular weight by sedimentation studies and to contain the original viral DNA sequence by DNA hybridization techniques. The amount of intracellular T7 genome conserved was about 1500 viral equivalents per cell. During this same period, a considerable amount of T7 DNA taken up by the cell was degraded and reutilized by the synthesis of macromolecules. Reassociation kinetic analysis showed that the DNA from continuous stocks of cells which had taken up T7 DNA contained sequences homologous to the entire T7 genome 24 generations or 36 days later. The amount of DNA present in these cells indicated that efficient replication of this foreign DNA had taken place. These techniques may be utilized to provide a better understanding of the role played by DNA in oncogenesis.

5337 DEOXYRIBONUCLEIC ACID SYNTHESIS IN REGENERATING RAT LIVER STUDIED BY CYTOFLUOROMETRY IN COMBINATION WITH TRITIATED THYMIDINE AUTORADIOGRAPHY. *(E.)* Fujita, S. (Kyoto Prefect. Univ. Med., Japan), T. Ashihara, M. Fukada and O. Takeoka. *Acta Histochem Cytochem* 7(2):105-111, 1974.

In this study, different ploidy hepatocytes were studied using a combined cytofluorometric and autoradiographic technique in order to determine DNA synthetic behavior. Five (67%) hepatectomized Donryu rats were used. Two rats received 100 μCi ^{3}H-thymidine i.p., one 24 hours following hepatectomy, the other 48 hours following surgery, and were sacrificed 30 minutes later. One rat received a similar dose of ^{3}H-thymidine 48 hours following hepatectomy and sacrificed 3 hours later. The last two rats were cummulatively labeled by ^{3}H-thymidine every five hours beginning 20 hours following hepatectomy and was sacrificed 3 hours later. The last surgery and 30 min after receiving the third and fourth injection of ^{3}H-thymidine, the animals were sacrificed. The results indicate that the S-phases of diploid and tetraploid hepatocytes are 6.7 and 8 hours resp. In the first 30 hours following hepatectomy, diploid and tetraploid cells were labeled, whereas from 30 to 35 hours post-hepatectomy, tetraploid cells were the most prominently labeled. Forty-eight hours following hepatectomy, both diploid and tetraploid were labeled. The authors conclude that the tetraploid hepatocytes are the most important cells involved in regeneration in rat liver.

5338 GRANULOCYTIC CHALONE. *(E.)* Rytomaa, T. (Univ. Helsinki, Finland). *Bibl Haematol* (39):885-889, 1973.

Granulocytic chalone was compared to a previously purified specific granulocytic inhibitor with respect to its separation and chemical activities to determine if they were identical compounds. Chalone (a tissue-specific chemical inhibitor produced by a tissue to control cell proliferation in that same tissue) was obtained from granulocytes collected from rat ascitic fluid. This granulocytic chalone has been characterized as a polypeptide whose molecular weight was found to be less than 5,000. It inhibited DNA synthesis in leukemic and normal bone marrow *in vivo* and *in vitro*. It is concluded that since the characteristics of the granulocytic inhibitor are the same as those reported above, granulocytic chalone and the granulocytic inhibitor are identical.

5339 EPIDERMAL CHALONE: CELL CYCLE SPECIFICITY OF TWO EPIDERMAL GROWTH INHIBITORS. *(E.)* Elgjo, K. (Inst. Gen. Exp. Pathol., Rikshop., Oslo, Norway). *Natl Cancer Inst Monogr* 38:71-76, 1973.

The chemical nature and mechanism of action of the epidermal chalone prepared from hairless mouse skin were investigated. Hairless mice were injected i.p. with lyophilized crude water extracts of whole epidermis and the effects on the epidermal mitotic rate and epidermal DNA synthesis were determined. The extracts inhibited mitosis during the G_2 phase and the late part of the G_1 phase (the presynthetic phase), but appeared to have no effect on the cells in the late G_2 phase. To estimate the rate of turnover of the epidermal chalone, actinomycin D was applied topically to inhibit epidermal RNA synthesis; the treated area was then homogenized and extracted and the extracts injected into test mice. The effect of the extracts on the cells in G_2 disappeared 13 hr after actinomycin D treatment, while the inhibitory effect on the cells in the presynthetic phase was present even at 24 hr after the application of actinomycin D. When the epidermal cells from untreated animals were separated using trypsin, the G_2 inhibitor was extractable from the basal cells and the G_1 inhibitor was extractable from the keratinizing cells. The results suggest that a factor with a relatively short turnover time which acts on epidermal cells in the G_2 phase is present in or produced by the epidermal basal cells; a component with a longer turnover time which regulates the rate of entrance of the cells from G_1 into S phase appears to be produced by the epidermal keratinizing cells.

5340 EPIDERMAL CHALONE AND INHIBITION OF DNA SYNTHESIS. *(E.)* Rothberg, S. (Med. Coll. Virginia, Richmond) and B. C. Arp. *Natl Cancer Inst Monogr* 38:93-98, 1973.

In order to clarify the role of chalone in epidermal proliferation and to determine how it is involved in the regulation of DNA synthesis, aqueous epidermal extracts from newborn and adult hairless mouse epidermis were partially purified by alcohol and ammonium sulfate precipitation to yield fractions which actively inhibited DNA synthesis in cultured mouse skin. The active protein fraction consisted of at least two components having molecular weights of 61,000-70,000 daltons. A heat-stable dialyzable component, separated from the epidermal extract prior to or following purification, was active in inhibiting DNA synthesis in cultured mouse skin. The newborn mouse extract contained a dialyzable component which was not present in the adult mouse extract and which activated the inhibition of DNA synthesis with or without the protein fraction (F_1 and F_2). Epinephrine was not essential for maximal inhibition in all fractions, although, in some, inhibition of DNA synthesis was enhanced by the addition of epinephrine to the skin culture system. Although these results do not indicate whether the epidermal chalone which inhibits mitosis is the same as or different from that which inhibits DNA synthesis, they tentatively suggest that the two may be different substances.

5341 ACQUIREMENT OF FETAL PROPERTIES IN HEPATOMA ON GLUTATHIONE METABOLISM. *(E.)* Taniguchi, N. (Hokkaido Univ. Sch. Med., Sapporo, Japan), Y. Tsukada and H. Hirai. *Biochim Biophys Acta* 354(2):161-167, 1974.

The glutathione peroxidase/glutathione reductase activity ratio was determined in the high-speed supernatant fraction of adult, fetal, and newborn rat (male Donryu) livers, and in 4-dimethylaminoazobenzene (DAB)-induced primary rat hepatomas. The glutathione peroxidase glutathione reductase activity ratio was dependent on the age of the animal, the ratio increasing with increasing age to a maximum of about 5.90 (20 weeks). The fetal level showed a ratio of 1.5-2.0, which was similar to the values obtained for the DAB-induced hepatomas and for some transplantable hepatomas originating from the azo dye-induced hepatoma. The ratio in four transplantable ascites hepatomas was 1.10-1.78, although two other tumors gave values of 2.82 and 3.00. The ratios in the livers of the tumor-bearing rats was higher than those of the tumor cells. The glutathione contents of the azo dye-induced hepatomas and ascites hepatomas were also similar to those found in the fetal livers, while the contents in the livers of the tumor-bearing rats were considerably higher. The results suggest that hepatoma tissue may reacquire fetal properties with respect to glutathione metabolism.

5342 ENZYME HISTOCHEMISTRY OF HUMAN TUMORS: INDICATIONS OF DIFFERENTIATION AND FUNCTIONING. *(E.)* Willighagen, R. G. J. (No affiliation) and A. C. Nieuwenhuyzen-Kruseman. *Recent Results Cancer Res* 44:57-62, 1974.

The relationship between histochemically demonstrabl enzyme activity and morphological and functional differentiation was studied in a variety of human tumors. There was a distinct correlation between the activity of nonspecific esterases in squamous-cell carcinomas of the lung and the biological behavior of these tumors as expressed in survival time after surgery. The activity of these esterases appeared to be a better indication of the grade of differentiation of the tumor cells than were the morphological features of the tumors. In patients with adenocarcinoma of the endometrium, treatment with progesterone derivatives was followed by decreases in the activity of alkaline phosphatase; these changes in enzyme activity generally preceded morphological changes characteristic of the normal epithelium. In another group of patients, enzymes necessary for hormone production (glucose-6-phosphat dehydrogenase and 3-beta-ol-sterol dehydrogenase) were always present in hormone-producing tumors of the adenal cortex, whereas in nonfunctioning tumors, their presence was variable. The presence of hormones such as alkaline phosphatase, which is not related to hormone production, was also variable. There was also a relationship between functional differentiation and the activity of alkaline phosphatase in the adrenal cortex carcinomas. Among 50 lung tumors tested, seven gave a positive immunofluorescence for adrenocorticotrophic hormone; autopsies in three of these cases showed hyperplasia of the adrenal cortex as in Cushing's syndrome.

5343 HYDROLYSIS OF 2',3'-CYCLIC ADENOSINE MONOPHOSPHATE AND 3',5'-CYCLIC ADENOSINE MONOPHOSPHATE IN SUBCELLULAR FRACTIONS OF NORMAL AND NEOPLASTIC MOUSE SPLEEN. *(E.)* Konings, A. W. T. (Lab. Radiopathol, State Univ. Gronigen, Netherlands) and D. A. Pierce. *Life Sci* 15(3):491-499, 1974.

The subcellular distribution of 3',5'-cAMP phosphodiesterase (3',5'-cAMPase) and 2',3'-cAMP phosphodiesterase (2',3'-cAMPase) activities in mouse spleen were studied. Control, X-irradiated (600 rads) and lymphosarcoma injected (10^6 lymphosarcoma spleen cells i.p.) C57BL mice were studied 48 hours after X-irradiation and seven days following lymphosarcoma injection. The highest activities of 3',5'-cAMPase and 2',3'-cAMPase were found in the cytoplasm and particulate fractions resp. The control mouse spleen 3',5'-cAMPase activity level was four times higher than that in tumor injected mice. Imidazole stimulated tumor and control 3',5'-cAMPase activities to the same degree. Tumor 2'-3'-cAMPase activity was approximately two times higher than control. X-irradiation had no effect of 3',5'-cAMPase activity but significantly decreased 2',3'-cAMPase activity to 50% of control values. It is suggested that 3', 5'-cAMPase and 2',3'-cAMPase may be different enzymes in normal and neoplastic mouse spleen.

5344 MULTIPLE FORMS OF CYCLIC 3',5'-AMP PHOSPHODIESTERASE OF RAT CEREBRUM AND CLONED ASTROCYTOMA AND NEUROBLASTOMA CELLS. *(E.)* Uzunov, P. (Natl. Inst. Mental Health, St. Elizabeth's Hosp., Washington, D.C.), H.M. Shein and B. Weiss. *Neuropharmacology* 13(5):377-391, 1974.

Cyclic 3',5'-AMP phosphodiesterase (3',5'-cAMPase) activity was measured following electrophoretic separation of the soluble supernatant fractions of cloned rat astrocytoma (C6 and C2), mouse neuroblastoma (NIE and N18) and rat cerebrum. Four peaks (designated I-IV) of 3',5'-cAMPase activity were found in rat cerebrum. Three peaks of 3',5'-cAMPase activity corresponding to peaks I, II, and III, two peaks corresponding to peaks I and IV, and one peak corresponding to peak III, were found in the C6 astrocytoma, C2 astrocytoma and the neuroblastoma cell lines respectively. The soluble supernatant fractions of those tissues having electrophoretically separable forms of 3',5'-cAMPase demonstrated multiple forms by kinetic analysis. Kinetic analysis of the separated forms were linear. Peak II 3',5'-cAMPase from all tissue sources was found to be activated up to tenfold by an endogenous heat stable activator which had no effect of the activities of peaks I, III, and IV. Trifluoperazine inhibited peak II more than peak III, and theophylline inhibited peak III more than peak II. This occurred regardless of the tissue source. Peaks III and IV were very unstable at 4 C (half-life was less than one day) whereas peaks I and II were essentially unaffected by two weeks of storage. It is concluded that there are multiple forms of 3',5'-cAMPase present in normal and neoplastic central nervous system tissue.

5345 A COMPARISON OF THE TRANSCRIPTION OF MOUSE CELL CHROMATIN BY HOMOLOGOUS RNA POLYMERASE I AND II. *(E.)* Howk, R. S. (Meloy Lab., Rockville, Md.), D. R. Williams, A. B. Haberman, W. P. Parks and E. M. Scolnick. *Cell* 3(1):15-22, 1974.

An *in vitro* system for the transcription of mouse cell chromatin by homologous mouse cell RNA polymerases has been developed. In this system, RNA polymerase I isolated from NIH Swiss mouse fibroblasts was able to transcribe unsheared chromatin of homologous mouse cells. The product of the transcription was single-stranded RNA, while the product transcribed from the same chromatin by homologous RNA polymerase II was a mixture of RNA-DNA hybrids and single-stranded RNA. RNA polymerase I eluted from DEAE-cellulose prior to RNA polymerase II and was the major RNA polymerase activity found in this region of DEAE-cellulose in extracts of whole mouse cells. The activity was completely insensitive to α-amanitin at concentrations up to 320 μg/ml. The results indicate that chromatin contains regions of both single-stranded and double-stranded DNA. They also indicate that RNA polymerases I and II transcribe chromatin differently, the difference in the products synthesized by the two enzymes possibly being due simply to the preference of purified RNA polymerase II for transcription of denatured DNA as compared with native DNA.

5346 STUDIES ON THE LYMPHOCYTE 5'-NUCLEOTIDASE IN CHRONIC LYMPHOCYTIC LEUKEMIA, INFECTIOUS MONONUCLEOSIS, NORMAL SUBPOPULATIONS AND PHYTOHEMAGGLUTININ-STIMULATED CELLS. *(E.)* Quagliata, F. (New York Univ. Med. Cent., New York), D. Faig, M. Conklyn and R. Silber. *Cancer Res* 34(12):3197-3202, 1974.

The 5'-nucleotidase (5'N) activity of lymphocytes from normal subjects, chronic lymphocytic leukemia (CLL) patients, and infectious mononucleosis patients was measured in order to determine if the previously reported decrease in 5'N activity in lymphocytes of CLL patients might be due to an altered B:T cell ratio, to determine if decreased levels are seen in other clinical conditions and to determine the relationship of lymphocyte proliferation to 5'N activity. The proportion B-lymphocytes was increased in CLL, but could not account for the lowered 5'N activity. Phytohemagglutinin stimulated thymidine incorporation into 5'N positive and 5'N deficient lymphocytes, but had little effect in reducing 5'N activity in 5'N positive lymphocytes while causing consistent reductions in 5'N activity in deficient cells. Diphosphopyridine nucleotide diaphorase adtivity was normal in lymphocytes from CLL patients. Normal 5'N activity was found in patients suffering cardiopulmonary, metabolic, hematological, dermatological, and carcinoid disorders. Infectious mononucleosis patients were found to have decreased 5'N activity in early stages of the disease, however, the 5'N activity deficit gradually returned to normal. Isolated lymphoblasts in two of five patients with acute myeloblastic leukemia had decreased 5'N activity levels. It is suggested that 5'N activity levels in lymphocytes might be used in the biochemical characterization of patients with lymphoid leukemia.

5347 CELL SURFACE GLYCOSYLTRANSFERASE ACTIVITY IN NORMAL AND NEOPLASTIC INTESTINAL EPITHELIUM OF THE RAT. *(E.)* LaMont, J. T. (Harvard Med. Sch., Boston, Mass.), M. M. Weiser and K. J. Isselbacher. *Cancer Res* 34(12):3225-3228, 1974.

Cell surface glycosyltransferase (GT) enzymes and lectin agglutination with concanavalin A and wheat germ agglutinin were measured in intestinal cells obtained from normal ARS Fischer 344 rats, or rats with intestinal adenocarcinomas induced by dimethylhydrazine (10 mg/kg) weekly. Suspensions of neoplastic, small intestinal villus and crypt cells were studied. Cell surface GT levels were lower in villus cells than in tumor or crypt cells, when all cells were obtained from the small intestine. In contrast, normal colon epithelial cells showed much higher cell surface GT levels than colon tumor cells. Concanavalin A agglutinated small intestine tumor and crypt cells, but did not agglutinate small intestine villus cells or normal colon or neoplastic colon tumor cells. Wheat germ agglutinin agglutinated colon tumor cells, but not normal colon epithelial cells, or small intestinal cells. It is concluded that intestinal neoplastic transformations are accompanied by changes in cell surface GT activity and lectin agglutination. The changes in agglutination and cell surface GT activity differ in normal and neoplastic cells taken from the large and small intestine.

5348 CHANGES IN GLYCOLIPID GLYCOTRANSFERASES AND GLUTAMATE DECARBOXYLASE AND THEIR RELATIONSHIP TO DIFFERENTIATION IN NEUROBLASTOMA CELLS.

(E.) Moskal, J. R. (Biochem. Biophys. Program, Univ. Notre Dame, Indiana), D. A. Gardner and S. Basu. *Biochem Biophys Res Commun* 61(2):751-758, 1974.

The activities of tumor cell glycolipid glycosyltransferases (GGT) involved in the synthesis of neutral and acidic glycosphingolipids were measured *in vitro* in homogenates of neuroblastoma C-1300 tumors from A/J mice, and of cholinergic (NS-20) and adrenergic (NIE-115) clones of C-1300 tumors grown under various conditions. Dibutyryl-AMP did not stimulate uridine diphosphate galactose:LacTri-cer β galactosyltransferase but did stimulate the galactosyltransferases (GalT) involved in the transfer of galactose to lactosylceramide and 2-hydroxyceramide in the NIE-115 cells studied. The GalT activities using glucosylceramide, lactosylceramide, LacTri-cer and Lac-nTet-cer as substrates were two to seven times higher in the NS-20 and NIE-115 clone cells than in the parent C-1300 tumor cells. The activities of various glycolipid:sialyltransferases were also found to be higher in the clones than in the parent tumor cells. Glutamate decarboxylase activity was also measured and found to be higher in NS-20 clones than in NIE-115 clones. Dibutyryl-cyclic-AMP enhanced glutamate decarboxylase activity of the NIE-115 cells. A synthetic scheme is suggested for the synthesis of blood group B-type glycosphingolipids by neuroblastoma cells.

5349 ATP CITRATE (*pro*-3S)-LYASE ACTIVITY IN NORMAL TISSUE. MALIGNANT AND BENIGN TUMORS OF THE BREAST IN WOMEN.

(Pol.) Kwiatkowski, J. (Med. Acad., Gdansk, Poland), A. Szutowicz, H. Krejczy and S. Angielski. *Nowotwory* 24(4):229-232, 1974.

The activity of ATP citrate (*pro*-3S)-lyase was determined in breast tissue from 33 patients, aged 22-52 yr (average age 39.3 yr) with benign breast tumors; from 33 patients, aged 34-84 yr (average age 52 yr) with mammary carcinomas in different stages of development (T_1-T_4); unaffected breast tissue from these patients served as controls. The activity of ATP citrate (*pro*-3S)-lyase was related to the extent of pathological change. No activity was detected in normal breast tissue and in fibromas. Among patients with benign breast tumors, enzyme activity was lowest in patients with epithelial hyperplasia (0.64 ± 0.4 nM/mg protein/min) and highest among those with adenofibromas (4.6 ± 0.5 nM/mg protein/min). Intermediate values were found in tumors with proliferating epithelial cells (2.1 ± 0.4 nM/mg protein/min). The mean activity of ATP citrate (*pro*-3S)-lyase in mammary carcinomas was 7.4 ± 0.8 nM/mg protein/min. The enzyme activity appeared to be correlated with the rate of cell proliferation. It is suggested that during malignant transformation of the mammary glands ATP citrate (*pro*-3S)-lyase becomes activated and provides active acetyl groups which are utilized in the biosynthesis of steroids and fatty acids.

5350 IMMUNOFLUORESCENT STUDIES ON THE OCCURRENCE OF CATHEPSIN B1 AT TUMOR CELL SURFACES.

(E.) Sylven, B. (Karolinska Inst., Stockholm, Sweden), O. Snellman and P. Strauli. *Virchows Arch (Zellpathol)* 17(2):97-112, 1974.

The specific antibody against the lysosomal proteinase cathepsin B1 was isolated and labeled with fluorescein isothiocyanate to enable direct immunofluorescent screening of the localization of this enzyme. Normal cells, cultivated 3T3 fibroblasts, virus-transformed 3T3 lines, and malignant cell lines were studied. Normal nongrowing differentiated cells showed no receptor groups at their surface for this antibody. Polyoma virus- and simian virus 40-transformed cells, ascites tumor cells, and human epitheloid and epidermoid carcinoma cells showed positive fluorescent staining at or near their surfaces. This reaction was most marked in premitotic and mitotic cells. The increased availability of cathepsin B1 at tumor cell surfaces seems to be correlated with an altered stability and function of the lysosomal system, associated with a release of lysosomal enzymes onto the cell surface and into the microenvironment of tumors. The functional significance of a lysosomal proteinase for maintenance of cylic growth in tumors is correlated with current data from other authors. The presence of activated cathepsin B1 at or near tumor cell surfaces may contribute to invasive growth by changing the dynamics of membrane proteins and affecting the turnover rate of sialopeptides, by promoting the unmasking of antigenic sites and the exposure of agglutinin receptor sites, and by changing cellular adhesion properties.

5351 A PEROXIDASE INHIBITOR IN LEUKEMIC AKR MOUSE SPLEEN CELLS.

(E.) Strauss, R. R. (St. Margaret's Hosp., Boston, Mass.), B. B. Paul, R. J. Selvaraj and A. J. Sbarra. *Cancer Res* 34(12): 3220-3224, 1974.

A heat-stable, non-dialyzable peroxidase inhibitor in spleen cells of leukemic AKR mice was studied. Spleen cells (predominantly lymphocytes) from leukemic AKR mice were found to be deficient in peroxidase, hexose monophosphate shunt and glucose 6-phosphate dehydrogenase activities when compared to spleen cells from normal animals. The leukemic spleen cells did not kill *Escherichia coli* when tested for bactericidal activity *in vitro*, whereas normal spleen cells did. A 20,000 x g pellet fraction obtained from leukemic spleen cells demonstrated no peroxidase activity and was found to inhibit peroxidase activity in the same fraction obtained from normal spleen cells. Incubation of the 20,000 x g pellets of normal and leukemic spleen cells with *E. coli* and H_2O_2 proved the leukemic pellet to be devoid of bactericidal activity. The leukemic pellet abolished the bactericidal activity of the normal pellet under these conditions. The inhibitor activity was shown to be heat stable (30 min at 100 C) and nondialyzable.

5352 ENZYMES OF CARBOHYDRATE METABOLISM IN HUMAN TUMORS. 1. LACTATE, MALATE AND ISOCITRATE DEHYDROGENASES, ALANINE AND ASPARTATE AMINOTRANSFERASES. *(E.)* De Bersaques, J. (Dep. Dermatol., Univ. Ghent, Belgium). *J Cutaneous Pathol* 1(2):103-108, 1974.

The activities of five carbohydrate metabolism enzymes [lactate dehydrogenase (LDH), malate dehydrogenase (MDH), isocitrate dehydrogenase (ICDH), aspartate aminotransferase (GOT), alanine aminotransferase (GPT)] were determined by fluorometric micro-methods in biopsy specimens from epidermal tumors (basal and squamous cell epithelioma, keratoacanthoma, and verruca seborreica). These activities (expressed in moles of substrate transformed/hr/kg dry weight) were compared to activities in apparently normal epidermis. GPT activity was reduced in all cases. The other enzyme activities were generally increased, except for ICDH and GOT in squamous cell epitheliomas. These results support previous findings.

5353 SUBCELLULAR DISTRIBUTION OF CATECHOLAMINES AND ENZYMES IN NEUROBLASTOMA. *(E.)* De Potter, W. (Univ. Ghent Med. Sch., Belgium), A. De Schaepdryver, F. De Smet, M. J. Delbeke and C. Hooft. *Maandschr Kindergeneeskd* 42(11/12):456-457, 1974.

Biochemical investigations showed that 18 neuroblastomas contained, per gram of tissue, 716-32.148 mμg noradrenaline, 366-38.365 U dopamine-β-hydroxylase, 0-0.46 U tyrosine hydroxylase, 0-6.34 U dopa decarboxylase, and 0.05-5.23 U mono aminoxydase. After differential centrifugation of tumor homogenates, dopamine-β-hydroxylase was found in a particulate fraction and tyrosine hydroxylase and dopa decarboxylase in the supernatant. The distribution of noradrenaline in the tumors was similar to that of dopamine-β-hydroxylase, clearly different from that of marker enzymes, and more closely resembled the distribution observed in bovine splenic nerves than in splenic ganglia. Density gradient centrifugation revealed two types of distribution. In the first, the distribution of noradrenaline and dopamine-β-hydroxylase coincided and clearly differed from that of all marker enzymes. In the second type, the distribution of dopamine-β-hydroxylase did not completely parallel that of noradrenaline and was shifted to lower densities. In most cases, the median density of the noradrenaline peak was similar to the density of the storage particles of the splenic nerve axons.

5354 CONTROL OF ENZYME INDUCTION AND GROWTH IN TUMOR CELLS AND CELL HYBRIDS. *(E.)* Thompson, E. B. (Natl. Cancer Inst., Bethesda, Md.), M. E. Lippman and L. B. Lyons. *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* 343-356, 1973.

Somatic cell hybrids between hepatoma tissue culture (HTC) cells and transformed mouse fibroblast cells (L) were used to study differentiated functions in tissue culture. In HTC cells, but not in L cells, glucocorticoids induce the enzyme tyrosine aminotransferase, while L cells but not HTC cells display inhibition of macromolecular synthesis and of glucose utilization in response to such steroids. Both cell types contain specific cytoplasmic steroid receptors. In HTC x L cell hybrids, the aminotransferase is not expressed while the inhibitory responses of the L cell are still present. The hybrids appear to have both L cell and HTC cell steroid receptors. These results suggest that the negative control of tyrosine aminotransferase expression in hybrids is a relatively specific event. One model to explain these results is that there are specific gene sites required to interact with the HTC cytosol receptor-steroid complex to allow expression of the aminotransferase. Such sites may be masked in the hybrid. Although neither parental cell type shows contact inhibited growth, many hybrids between them do so. It is suggested that each parent has lost contact inhibited growth by a different mechanism, and the hybrids restore these functions in a complementary fashion.

5355 ANOMALIES OF DIFFERENTIATION IN CANCER: STUDIES ON SOME ISOZYMES IN HEPATOMA AND IN FETAL AND REGENERATING LIVER. *(E.)* Schapira, F. (Inst. Mol. Pathol., Univ. Paris, France), A. Hatzfeld and A. Weber. *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* 205-218, 1973.

Several enzymes with multiple molecular forms were studied and compared in hepatoma, and in fetal and regenerating liver in order to investigate anomalies of differentiation in cancer. There was a resurgence of aldolase A (muscle type) in slow-growing hepatomas, without resurgence of aldolase C (brain type) and with maintenance of aldolase B (liver type). On the contrary, in fast-growing hepatomas, fetal aldolases A and C were present, while normal adult aldolase B almost completely disappeared. Several authors have shown that in fast-growing hepatomas, liver-type pyruvate kinase levels were considerably lowered to the benefit of another form, similar but not identical to the muscle form. This study has shown that this form can be found in some other normal tissues, particularly placenta and fetal liver. In slow-growing hepatomas, both forms are found. Two isozymes of hexosaminidase (N-acetyl-β-glucosaminidase) were present in rat tissues and could be distinguished according to their thermostability and electrophoretic migration. In fast-growing hepatomas, the hexosaminidase isozymic pattern was different from the normal liver pattern and similar to the fetal one. In regenerating liver, after large hepatectomy, slight modifications of aldolase, pyruvate kinase, and hexosaminidase occurred; they were comparable to the modifications seen in slow-growing hepatomas, but very different from the isozymic changes in fast-growing hepatomas. It is concluded that the appearance in cancerous tissues of many fetal forms of enzymes, at the expense of the adult forms, is a phenomenon which seems general and is probably not due to cell multiplication alone.

5356 ESTROGEN RECEPTOR CONTENT AND HORMONE-RESPONSIVE GROWTH OF MOUSE MAMMARY TUMORS. *(E.)* Sluyser, M. (Netherlands Cancer Inst., Amsterdam) and R. Van Nie. *Cancer Res* 34(12):3253-3257, 1974.

Mammary tumors induced in ovariectomized GR/A mice by treatment with estrone (p.o.) or progesterone (s. c.) were transplanted serially into castrated GR/A mice which were left untreated or treated with estrone or progesterone. Estrogen receptor levels in the transplanted tumor were determined by measuring estradiol-^{3}H binding in the cytosol fraction of tumor homogenates. Hormone treated mice showed the most rapid tumor growth following transplantation, (tumors reaching a weight of 2.5 g in 19 days). Tumor growth in untreated mice was slow (tumors reaching a weight of 2.5 g in 35 days). Estrogen binding was high in treated mice, and low in untreated mice. Transplant generations five through eight grew quickly, reaching 2 g in 15 days in the presence and absence of hormone; and estrogen binding in both groups was low. It is suggested that in this system, only tumor cells that are lacking in estrogen receptors can multiply in the absence of progesterone and estrone. Data indicates that hormone-responsive mammary tumors in GR mice are mixed populations of hormone-dependent and hormone-independent cells.

5357 OESTROGEN RECEPTORS IN HUMAN BREAST CANCER TISSUE. *(E.)* Maass, H. (Dep. Obstet. Gynecol., Univ. Hamburg, West Germany) and G. Trams. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:203-207, 1974.

The responsiveness of pre and postmenopausal breast cancer patients, with and without estrogen receptors in their tumor tissue, to estradiol therapy was compared. Estrogen receptors in breast cancer tissue were assayed by agar gel electrophoresis of the 8S and 4S cytoplasmic estrogen transport factors. Specific estradiol binding was determined in breast cancer tissue of 240 patients with primary tumors and 122 patients with inoperable tumors or metastases. The estradiol binding capacity was correlated with the plasma levels of free estrogens (determined by radioimmunoassay). Tissues were sampled in the case of premenopausal patients at the beginning of the menstrual cycle, since cycle phase affected receptor values; patients with high plasma estradiol levels were excluded from the study. About 40-45% of all patients' tumor tissue contained estradiol receptor. Of 24 patients positive for receptor, 13 responded to estradiol therapy compared to 2/35 patients who were receptor-negative. The absence of estrogen receptors seems to be characteristic of hormone-independent tumors. The results indicate that patients with advanced breast cancer and estradiol receptors in their tumor tissue may show a clinical response.

5358 THE INFLUENCE OF A GLUCOCORTICOID ON THE LODGEMENT AND DEVELOPMENT IN THE LUNGS OF INTRAVENOUSLY INJECTED TUMOUR CELLS. *(E.)* De Brabander M. (Janssen Pharm., Dep. Cell Biol., Beerse, Belgium), F. Aerts and M. Borgers. *Eur J Cancer* 10(11):751-755, 1974.

The effect of the glucocorticoid hormone, triamcinolone acetonide, on the establishment of metastatic lung tumors was studied in mice following i.v. injection of fibrosarcoma cells (from a virus-transformed 3T3 mouse cell line). Lung metastases were initially measured by means of ^{3}H-thymidine tagged cells and radioautography of lung sections, but quantitative correlations could be achieved by dry weight measurements. The effect of 25 mg/kg of hormone was to increase the lodgement of tumor cells by 10% in the lungs and decrease it in the spleen and liver while tripling the amount of metastatic tumor growth by 14 days after injection. Cortisol had no effect on tumor cell viability *in vitro*. *In vivo*, triamcinolone acetonide appeared to enhance the survival of lodged tumor cells, as evidence by the much higher death rate of tumor cells in untreated hosts (as evaluated by loss of ^{3}H-thymidine label from the tagged cells). A possible mechanism for this effect may reside in the immunosuppressive properties of triamcinolone acetonide.

5359 ANTERIOR PITUITARY FUNCTION AND ITS SIGNIFICANCE IN THE AETIOLOGY OF ENDOMETRIAL CARCINOMA. *(E.)* Brown, R. (Dep. Obstet. Gynaecol., Univ. Newcastle upon Tyne, England). *J Obstet Gynaecol Br Commonw* 81(12):947-951, 1974.

Anterior pituitary function was determined by measuring blood levels of human growth hormone (HGH), thyroid stimulating hormone, luteinizing hormone (LH), and adrenocotrophic hormone in 25 endometrial carcinoma patients (carcinoma group), 50 postmenapausal bleeding patients and 50 uterovaginal prolapse patients. Protein bound iodine, cortisol and oral glucose tolerance tests were also performed. LH secretion was elevated significantly in the carcinoma group. No other differences in any of the parameters measured were found. The results do not support the theory that excessive anterior pituitary hormone production (particularly HGH) is a major etiological factor in endometrial carcinoma.

5360 THE ESTABLISHMENT OF A CELL STRAIN (PC-1) FROM A HUMAN LUNG CANCER. *(E.)* Hayata, Y. (Tokyo Med. Coll., Japan), K. Tsuji, K. Oho, T. Koh and Y. Shimosato. *Jpn J Clin Oncol* 4(2):115-124, 1974.

5361 ENDOTHELIAL PROLIFERATION AND TUMOR GROWTH: AN EXPERIMENTAL STUDY. *(E.)* Giordano, G. G. (Inst. Cancer Res. Fund. Senator Pascale, Naples, Italy), E. De Angelis and A. Narici. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:17-20, 1974.

5362 THE GROWTH AND METASTASIS OF AN ALLOGRAFTED LYMPHOMA IN NORMAL, DEPRIVED AND RECONSTITUTED MICE. *(E.)* Weston, B. J. (R. Cancer Hosp., London, England), R. L. Carter, G. C. Easty, D. I. Connell and A. J. S. Davies. *Int J Cancer* 14(2):176-185, 1974.

5363 ACCELERATED GROWTH OF A STRAIN SPECIFIC RAT TUMOUR TRANSPLANTED INTO F1 HYBRIDS. *(E.)* Rumma, J. (Dep. Pathol. Immunol., Monash Univ., Melbourne, Australia) and D. J. Davies. *Br J Cancer* 30(6):582-584, 1974.

5364 TRANSPLANTATION OF MOUSE PLASMACYTOMA TO THE HAMSTER'S CHEEK POUCH. I. CHANGES IN TUMOUR SIZE AND PARAPROTEIN CONCENTRATION IN THE SERUM OF THE HOST. *(E.)* Benbassat, J. (Hadassah Univ. Hosp., Jerusalem, Israel), M. Slavin and A. Zlotnick. *Br J Cancer* 29(2):143-150, 1974.

5365 THE CULTIVATION OF NORMAL BONE MARROW IN DIFFUSION CHAMBERS IMPLANTED SUBCUTANEOUSLY IN A BLOOD DONOR AND HIS MONOZYGOTIC TWIN BROTHER WHO HAD ACUTE MYELOBLASTIC LEUKEMIA. *(Ger.)* Essers, U. Technical Coll., Aachen, West Germany), H. W. Stuhlen, . Starke and E. Bohm. *Med Welt* 25(39):1534-1537, 1974.

366 REGULATION OF LIVER GROWTH. *(E.)* Desser-Wiest, L. (Inst. Cancer Res., Univ. Vienna, ustria). *Proc Fifth Int Symp Biol Characterization um Tumors, Bologna, April 4-6, 1973* 1:323, 1974.

367 CHROMOSOME ABERRATIONS AND CANCER: CYTOGENETICAL STUDIES OF 200 EFFUSIVE HUMAN TUMOURS. *E.)* Korsgard, R. (Inst. Genet., Univ. Lund, Sweden). *ereditas* 78(2):318-319, 1974.

368 THE USE OF CELL CULTURES FOR POSING GENETIC PROBLEMS IN INTERNAL MEDICINE. *(Ger.)* udiger, H. W. (Med. Clin., Univ. Hamburg, West Gerany). *Verh Dtsch Ges Inn Med* 80:1703-1707, 1974.

369 CHROMOSOME PATTERNS IN HUMAN MALIGNANCY. *(E.)* Levan, G. (Inst. Genet., Univ. Lund, weden) and F. Mitelman. *Hereditas* 78(2):320, 1974.

370 THE BANDING PATTERN IN PHILADELPHIA CHROMOSOME NEGATIVE CHRONIC MYELOID LEUKEMIA. *(E.)* itelman, F. (No affiliation), L. Brandt and P. G. ilsson. *Hereditas* 78(2):302-303, 1974.

5371 CYTOGENETICAL STUDIES WITH G-BAND TECHNIQUE OF ESTABLISHED CELL LINES OF HUMAN MALIGNANT GLIOMAS. *(E.)* Mark, J. (Cent. Hosp. Skovde, Sweden), J. Ponten and B. Westermark. *Hereditas* 78(2):304-307, 1974.

5372 EHRLICH ASCITES TUMOR OF THE MOUSE. KARYOTYPE VARIATION BETWEEN AND WITHIN VARIOUS *IN VIVO* AND *IN VITRO* LINES. *(E.)* Neilsen, K. (Inst. Genet., Univ. Lund, Sweden). *Hereditas* 78(2):3109, 1974.

5373 HAPTOGLOBINS IN CHRONIC LYMPHATIC LEUKEMIA. *(E.)* Papiha, S. S. (Dep. Hum. Genet., Univ. Newcastle upon Tyne, England), A. L. Jones, B. Thompson and D. Carr. *J Med Genet* 11(4):349-352, 1974.

5374 LIGHT AND ELECTRON MICROSCOPICAL ANALYSIS OF CELL TYPES IN HUMAN SEMINOMA. *(E.)* Holstein, A. F. (Dep. Microsc. Anat., Univ. Hamburg, West Germany) and F. Korner. *Virchows Arch (Pathol Anat)* 363(2):97-112, 1974.

5375 HEPATIC MICROSOMAL DRUG-METABOLIZING ENZYMES IN RATS BEARING GUERIN CARCINOMA FOR VARIOUS PERIODS. *(E.)* Basu, T. K. (Marie Curie Mem. Found., Oxted, England), D. V. Parke and D. C. Williams. *Cytobios* 11(42):71-74, 1974.

5376 THE INFLUENCE OF DHEA AND ITS SULFOCONJUGATES ON PRIMARY EXPLANTS OF HUMAN NORMAL AND NEOPLASTIC TISSUES. *(E.)* Brachetti, A. K. J. (Dep. Obstet. Gynecol., Univ. Saarland, Hamburg, West Germany), W. Rindt, G. W. Oertel and A. S. Tranekjer. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:276-278, 1974.

5377 CHANGES IN THE CYCLIC AMP CONCENTRATION IN PHYTOHEMAGGLUTININ-TRANSFORMED AND LEUKEMIA CELLS. *(Ger.)* Schwarzmeier, J. D. (1st Med. Clin., Univ. Vienna, Austria), N. Honetz, E. Neumann and K. Mittermayer. *Verh Dtsch Ges Inn Med* 80:1492-1495, 1974.

5378 PHOSPHORUS METABOLISM IN CANCERS. *(E.)* Boggust, W. A. (Dep. Exp. Med., Trinity Coll., Dublin, Ireland). *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:279-289, 1974.

5379 STUDIES OF IRON METABOLISM; USING ^{59}Fe, IN PATIENTS WITH PLASMA CELL TUMORS. *(Ger.)* Glaubitt, D. (Westend Clin., Free Univ., Berlin, Germany) H. Gerhartz and J. Schneider. *Verh Dtsch Ges Inn Med* 80:1699-1703, 1974.

5380 MALIGNANT NEUROGENIC TUMORS OF THE AUTOMATIC NERVOUS SYSTEM AND CATECHOLAMINE METABOLISM. *(Ger.)* Kaser, H. (No affiliation). *Helv Paediatr Acta* Suppl. 32:3, 1974.

5381 REVERSE TRANSCRIPTASE ACTIVITIES IN PRELEUKEMIA. *(Ger.)* Moser, K. (1st Med. Clin., Univ. Vienna, Austria), H. Rainer, E. Deutsch, E. Pittermann, P. Hocker and A. Stacher. *Verh Dtsch Ges Inn Med* 80:1483-1485, 1974.

5382 REVERSE TRANSCRIPTASE ACTIVITIES IN PLASMA FROM THREE PATIENTS WITH BREAST CANCER. *(Ger.)* Rainer, H. (1st Med. Clin., Univ. Vienna, Austria) K. Moser and E. Deutsch. *Verh Dtsch Ges Inn Med* 80:1654-1658, 1974.

5383 THE EFFECT OF VARIOUS FACTORS ON DNA POLYMERASE IN VITRO. *(Ger.)* Piller, G. (1st Med. Clin., Univ. Vienna, Austria), E. Deutsch, K. Moser and H. Rainer. *Verh Dtsch Ges Inn Med* 80:1652-1654, 1974.

5384 A STUDY OF DIET AND BREAST CANCER. *(E.)* Miller, A. B. (Natl. Cancer Inst. Canada, Toronto), V. L. Matthews, N. W. Choi and L. Munan. *Am J Epidemiol* 100(6):508, 1974.

5385 EFFECT OF PHENYLALANINE-ENRICHED DIET ON GROWTH OF EHRLICH ASCITES TUMOR CELLS. *(E.)* Yanagi, S. (Osaka Univ. Med. Sch., Japan), T. Noguchi, K. Imamura and T. Tanaka. *Gann* 65(5):423-427, 1974.

5386 THE POSSIBLE EFFECT OF METEOROLOGICAL STRESS ON CANCER AND ITS IMPORTANCE FOR PSYCHOSOMATIC CANCER RESEARCH. *(E.)* Tromp, S. W. (Biometerol. Res. Cent. Leiden, Netherlands). *Experientia* 30(12):1474-1478, 1974.

5387 SPONTANEOUS NEOPLASMS IN AGING GERBILLINAE. A SUMMARY OF FORTY-FOUR NEOPLASMS. *(E.)* Rowe, S. E. (Unit Lab. Anim. Med., Univ. Michigan, Ann Arbor), J. L. Simmons, D. H. Ringler and D. M. Lay. *Vet Pathol* 11(1):38-51, 1974.

5388 PROBLEMS OF THE CELLULAR-CYTOTOXIC TEST IN HUMAN TUMORS. *(Ger.)* Pees, H. W. (Med. Clin., Univ. Homburg/Saar, Germany). *Verh Dtsch Ges Inn Med* 80:1662-1664, 1974.

5389 GUIDELINES ON THE ANALYSIS OF TUMOUR RATES AND DEATH RATES IN EXPERIMENTAL ANIMALS. *(E.)* Peto, R. (Radcliffe Infirm., Oxford, England). *Br J Cancer* 29(2):101-105, 1974.

5390 THE BIOCHEMICAL DIFFERENTIATION OF LEUKEMIA AND NORMAL CELLS. *(Ger.)* Pittermann, E. (Ludwig Boltzmann Inst. Leukemia Res., Vienna, Austria), U. Ganzinger, A. Stacher, K. Moser, H. Rainer and E. Deutsch. *Verh Dtsch Ges Inn Med* 80:1480-1483, 1974.

5391 THE ROLE OF THE CELLULAR MICRO-ENVIRONMENT. *(E.)* Maltoni, C. (Inst. Oncol. F. Addarii, Bologna, Italy). *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:10-16, 1974.

5392 STUDIES ON POLYSACCHARIDE COAT OF TUMOUR CELL. *(E.)* Sugar, J. (Res. Inst. Oncopathology, Budapest, Hungary), O. Csuka and E. Olah. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:304-308, 1974.

5393 SPECIAL CYTOCHEMICAL AND ELECTRON MICROSCOPI EXAMINATION IN MYELOPROLIFERATIVE DISORDERS. *(Jpn.)* Miura, A. (Akita Univ. Sch. Med., Japan). *Jpn J Clin Pathol* 22(10):695-699, 1974.

5394 PLATELET FUNCTION ABNORMATLITIES IN THE MYELOPROLIFERATIVE DISORDERS. *(E.)* Adams, T. (Univ. California Los Angeles Sch. Med.), L. Schutz and L. Goldberg. *Scand J Haematol* 13(3):215-224, 1974.

5395 THE CARTILAGE ANALOGUE OF FIBROMATOSIS (JUVENILE APONEUROTIC FIBROMA) IN DOGS. *(E.)* Liu, S. K. (Anim. Med. Cent., New York, N.Y.) and H. D. Dorfman. *Vet Pathol* 11(1):60-67, 1974.

5396 INFLUENCE OF CHANGES IN CONTENTS OF EXTRAVASCULAR FIBRIN IN TUMORS UPON METASTASIS. *(Ukr.)* Sopotinskaya, E. B. (Acad. Sci., USSR). *Dopov Acad Nauk Ukr RSR Ser B* (7):657-659, 1974.

5397 CANCERS OF THE LARYNX AND HYPOPHARYNX II-LARYNGEAL CARTILAGE BEHAVIOUR. *(E.)* Nirmala, P. (St. John's Med. Coll., Bangalore, India), J. A. Thomas and S. N. Kothare. *J Postgrad Med* 20(4):160-165, 1974.

5398 STUDIES ON THE COMPOSITION OF THE THYROID PSAMMOMA BODIES OF CHRONICALLY IODINE-DEFICIENT RATS. *(E.)* Berthezene, F. (Univ. Oregon Med. Sch., Portland) and M. A. Greer. *Endocrinology* 95(3):651-659, 1974.

5399 THE EXISTENCE OF A PLASMA FACTOR WHICH PROMOTES PROLIFERATION OF MULTIPOTENTIAL STEM CELLS. *(Ger.)* Essers, U. (Dept. Internal Med. II, Technical Coll., Aachen, West Germany), S. Joost and E. Brunner. *Verh Dtsch Ges Inn Med* 80:1507-1510, 1974.

5400 URINARY EXCRETION OF 17-KS, 17-OHCS AND PHENOLSTEROIDS IN MALES WITH BREAST CANCER. *(E.)* De Giuli, G. (Inst. Radiol. Univ., Firenze, Italy) and S. De Giuli. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:213-217, 1974.

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PREFACE

Carcinogenesis Abstracts is a publication of the National Cancer Institute. The journal serves as a vehicle through which current documentation of carcinogenesis research highlights are compiled, condensed, and disseminated on a regular basis. It represents an integral part of the Institute's program of fostering and supporting coordinated research into cancer etiology. Issues of *Carcinogenesis Abstracts* normally contain three-hundred abstracts and three-hundred citations (unaccompanied by corresponding abstracts). Abstracts and citations refer to the current scientific literature that describes the most significant carcinogenesis research carried on at the National Cancer Institute, other governmental agencies, and private institutions. *Carcinogenesis Abstracts* is intended to be a highly useful current awareness tool for scientists engaged in carcinogenesis research or related areas. The great number and diversity of publications relevant to carcinogenesis make imperative the availability of this service to investigators whose work requires that they keep abreast with current developments in the field.

Carcinogenesis Abstracts is normally published monthly. Volume XII covers the scientific literature published from Jan 1974 through Dec 1974. To increase the usefulness of *Carcinogenesis Abstracts*, Volume XII, a Wiswesser Line Notation index and a Chemical Abstracts Service Registry Number index have been provided. These indexes reference compounds described in abstracted articles. A cumulative subject, author, CAS Registry Number, and Wiswesser Line Notation index for Volume XII will be published shortly after the final regular issue.

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NOTE

Journal names are abbreviated according to the list of abbreviations used by *Index Medicus*. For ournals not covered by *Index Medicus*, the abbreviations (with some modifications) found in *World Medical eriodicals*, 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jap.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
In.	Indonesian	Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

CTH	adrenocorticotropic hormone	mg	milligram(s)
DP	adenosine diphosphate	min	minute(s)
MP	adenosine monophosphate	ml	milliliter(s)
TP	adenosine triphosphate	mm	millimeter(s)
	degrees centigrade	MTD	maximum tolerated dose
n	centimeter(s)	ng	nanogram (10^{-9})
NS	central nervous system	pg	picogram (10^{-12})
pm	counts per minute	p.o.	orally
NA	deoxyribonucleic acid	ppm	parts per million
g.	for example	r	Roentgen
	gram(s)	RBC	red blood cells (erythrocytes), red blood count
	microgram(s)		
	hour(s)	resp.	respectively
m.	intramuscular	Rev.	review (only in citations)
p.	intraperitoneal	RNA	ribonucleic acid
	international unit(s)	s.c.	subcutaneous
v.	intravenous	sec	second(s)
	kilogram(s)	U	unit(s)
$_{50}$	median lethal dose(s)	UV	ultraviolet
	meter(s)	WBC	white blood cells (leukocytes), white blood count
	molar		
q	milliequivalent(s)	wk	week(s)
	millimolar	wt	weight(s)
	micromolar	yr	year(s)
,μC	milli-,microcurie(s)		

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5401 ETIOLOGIC FACTORS IN CANCER OF THE BREAST IN HUMANS.

(E.) Papaioannou, A. N. (Evan-elismos Med. Cent., Athens, Greece). *Surg Gynecol tstet* 138(2):257-287, 1974.

ecent information relating to the role of endocrine, iral, genetic, immunologic and miscellaneous factors n the etiology of human breast cancer is reviewed. f the estrogens, estradiol is a weaker carcinogen han estrone, and estriol has virtually no carcinoenic potential and may even prove valuable in the herapeutic and prophylactic treatment of breast ancer. Progesterone appears to have a significant mmunosuppressive effect, but its influence on human reast carcinogenesis is unknown. Similarly, although he thyroid hormones, corticosteroids, and androgens ay have significant effects on the development of reast cancer, their role remains obscure. At preent there is no significant evidence relating the se of oral contraceptive hormones to breast carinogenesis. Viruses have long been known to produce xperimental breast tumors in animals, and recent vidence suggests that the ribonucleic acid type ncogenic viruses may be important in the etiology f the human disease, although the origin, transmision and significance of the viral infection in umans has not been established with absolute cerainty. In contrast, while the development of breast ancer in animals is strongly dependent on their enetic constitution, associations of this type in umans are weak. What may be under genetic control n humans is susceptibility or resistance to viral nfection. In a general way, immunologic factors ppear to play a major role in carcinogenesis and articularly in the development of breast cancer. enetic, viral, chemical, hormonal, and other posible factors may influence immunity sufficiently to ffect susceptiblity to the development of malignant umors. Other factors which have been positively r negatively associated with human breast cancer nclude injury to the breast, socioeconomic factors, enign conditions of the breast, other primary caners, environmental temperature, radiation exposure, tress, and dietary factors, particularly fats. Irespective of the factors involved, evidence indicates hat the initial events of malignant change probably ake place early in life. (387 references)

402 A COMBINED BACTERIAL AND LIVER TEST SYSTEM FOR DETECTION AND CLASSIFICATION OF CARINOGENS AS MUTAGENS.

(E.) Ames, B. N. (Biochem. ep., Univ. California, Berkeley). *Genetics* 78(1): 1-95, 1974.

arcinogens are detected and classified using *Salonella* tester strains developed for mutagen detecion and a rat (or human) microsomal hydroxylase ystem. Carcinogens detected as active frameshift utants with this coupled system include aminobihenyl, amino and dimethylamino *trans*-stilbene, 2-mino and 2-acetylaminofluorene, aminoanthracene, enzidine, aminopyrene, aminocrysene, dimethylenzanthracene, benzpyrene, and aflatoxin B_1. The tructural features of these carcinogens are disussed in relation to the theory of frameshift mutaenesis. Other carcinogens have been detected as utagens causing base pair substitutions. It is concluded that carcinogens cause cancer by somatic mutation, and that compounds which give a positive response in the test should be considered potentially hazardous for man. A simple test for detecting mutagens in urine has also been developed. (8 references)

5403 SOME CURRENT THRESHOLDS OF RESEARCH IN CHEMICAL CARCINOGENESIS.

(E.) Miller, J. A. (Univ. Wisconsin Med. Cent., Madison) and E. C. Miller. *Biochem Dis* (Part A):61-85, 1974.

Evidence that a high percentage of human cancer has an environmental element in its etiology is presented. Environmental chemicals, both natural and man-made, appear to be important causative agents of cancer at sites other than the skin. The ultimate carcinogenic forms of chemical carcinogens are postulated to be electrophilic reactants which combine with nucleophilic groups in protein and nucleic acids to give rise to covalently bound derivatives. The nature of the metabolic activation to probable ultimate reactive and carcinogenic forms is predicted for several classes of chemicals, including alkylating agents, epoxides of polycyclic hydrocarbons and naturally occurring compounds such as safroles. Metabolic activation and deactivation of 2-acetylaminofluorene is discussed in detail. Studies to determine the nature of the critical targets of ultimate carcinogens are reviewed with emphasis on attempts to correlate levels of specific protein-, DNA-, and RNA-bound carcinogen derivatives with the likelihood of tumor induction by that carcinogen. Other studies that should provide a more coherent understanding of chemical carcinogenesis are being conducted with respect to the relationship between chemical carcinogenesis and chemical mutagenesis, epigenetic mechanisms, the role of viruses or integrated viral genomes in carcinogenesis by chemicals, and the origin and importance of tumor-specific transplantation antigens of chemically-induced tumors. (94 references)

5404 SUMMARY OF THE CHEMICAL ASPECTS OF CARCINOGENESIS.

(E.) Pullman, B. (Inst. Phys. Chem. Biol., Edmond de Rothschild Found., Paris, France). *Biochem Dis* 4(Part B):717-727, 1974.

Current aspects and problems in the field of research into chemical carcinogenesis are discussed. The nature of the proximate or ultimate carcinogen (initial molecule or metabolite?), the role of radical cations in carcinogenesis by polycyclic hydrocarbons, whether the interaction between the cellular receptor (nucleic acids or proteins?) and the carcinogen is physical or chemical in nature; and the relation of carcinogenesis to mutagenesis: these are cited as the delimiting factors of research. The first problem seems to have been resolved in favor of the metabolite, but the problem still remains of the nature of the proximate carcinogens. The cation radicals, the K-region epoxides and the free radical(s) are those most likely to perform this function. The question is raised, however, whether the same type of proximate carcinogen should be considered for the unsubstituted and substituted polycyclic hydrocarbons, or whether two different such carcinogens should be considered for the two groups. Within the third area of discussion, no progress has been made that enables the researcher to identify either the nucleic acids or proteins as principal receptors. However, the nature of the interaction seems definitively to be chemical. Concerning the relation of carcinogenesis to mutagenesis, it has been determined that the metabolic activation of potential mutagens is most important in the manifestation of their mutagenic activity. In conclusion, the value of model studies is stressed. (No references)

5405 THE CELLULAR RESPONSE TO CYTOCHALASIN B: A CRITICAL OVERVIEW. *(E.)* Copeland, M. (Child. Cancer Res. Found., Boston, Mass.). *Cytologia (Tokyo)* 39(4):709-727, 1974.

A review of the literature on the diverse effects of the fungal metabolite cytochalasin B is presented. Some of these effects are morphological in nature and include cytoskeletal variation, multinucleation, diffuse organelle alteration, nuclear extrusion, and surface phenomena of diminished membrane swelling; other effects are functional or physiological and include inhibition of cell motility, of mitotic reproduction and of phagocytosis and pinocytosis, as well as alterations of surface adhesion properties and microfilaments and depression of synthesis or uptake of membrane components. The published data indicate an essential relationship between the action of cytochalasin B and common cellular processes involving the surface membrane. The functional nature of this relationship as it pertains to cell motility, cytokinesis, surface adhesion, and phagocytotic activities will require further investigation. Whether cytochalasin B enters the cell or is surface-bound to an enzyme or other molecular complex located at the plasma membrane should be determined. Studies on the mobility of labeled cytochalasin B might clarify this problem and also demonstrate the association of a specific transport mechanism with which the drug might interact. The apparent role of cytochalasin B as an agent which disturbs the cell surface makes this antibiotic potentially useful in investigations of membrane-oriented aspects of cell physiology. (76 references)

5406 VIRUSES AS THE POSSIBLE CAUSE OF CANCER. *(E.)* Van der Noordaa, J. (Lab. Gezond., Amsterdam, Netherlands). *Maandschr Kindergeneeskd* 42(9-10):365-368, 1974.

Evidence for a possible viral etiology of some human tumors is reviewed. There is considerable evidence that viruses are responsible for the development of leukemia and sarcomas in mice and chickens. However, the human equivalent of these oncorna viruses has not yet been found, despite many attempts. Although there is some evidence for the presence of murine oncorna virus genetic material in human leukemic cells, these findings are difficult to interpret. Similarly, although an oncorna virus has been isolated from the mammary tumors of mice, no such virus has been found in humans. In contrast, the herpes viruses have been related to the pathology of Burkitt's lymphoma and cervical carcinoma in humans; herpes viruses have also been isolated and found to cause Marek's disease, renal carcinomas, and some lymphomas in various animal species. Another group of viruses, the human adenoviruses, can induce tumors in hamsters but seem unable to do so in the natural host. Among the papova viruses, the Simian virus 40 (SV40) has been used to study the mechanism of cell transformation. These studies have shown that the viral genetic material remains in the transformed cell and that the viral DNA becomes integrated into the cellular DNA. Integration of the viral DNA may be an important step in both normal viral multiplication and the transformation process as a whole. Integration and subsequent excision of the viral DNA from cellular DNA seems to occur during viral multiplication; the significance of this finding is unclear. (No references)

5407 STATE OF THE ART OF STUDIES ON VIRAL CARCINOGENESIS. *(Hun.)* Lapis, K. (First Pathoanat. Inst., Semmelweiss Med. Univ., Budapest, Hungary) and Zs. Schaff. *Orv Hetil* 115(19):1083-1091, 1974.

The classification and morphology, as well as theories and assumptions on the action mechanism of oncogenic viruses in animals and humans are reviewed. Virus production by the infected or transformed cell, induction of virus production in the cell through extraneous activation, e.g., by chemical substances, UV or X-ray irradiation, and absence of virus production in the cell under any conditions in the presence of virus gene fragments are the possible relationships between oncogenic viruses and the host cell. Certain viruses have been ascertained to be able to induce cell transformation *in vitro*, and tumor formation when transferred into animals. Such viruses do not differ from non-oncogenic viruses morphologically or in their mode of replication. Spontaneous mutation or UV irradiation, may lead to the loss of oncogenic properties, or may transform initially non-oncogenic viruses into oncogenic ones. Observations suggest that the virus is not necessarily present in the transformed cell in viable form, and that the tumor cell does not necessarily produce mature virion. The virus gene incorporated into the cellular genetic material can, however, be detected indirectly, e.g., by the presence of 70 S RNA or reverse transcriptase, or of gs-1 and gs-3 antigens. Certain endogeneous or exogeneous factors, such as chemical carcinogens and X-ray, may lead to the manifestation of all or part of the virus gene, whereby the cell is enabled to produce virus with or without cell transformation. The virus may disappear from the cell transformed by it, leaving behind the products of the transcription. The suspected RNA virus in certain human tumors, as well as human adenoviruses and herpes viruses with oncogenic potential in animals suggest the absence of essential differences between human and animal tumors. (85 references)

08 A COMPENDIUM OF HERPESVIRUSES ISOLATED FROM
NON-HUMAN PRIMATES. *(E.)* Barahona, H.
lew England Reg. Primate Res. Cent., Southborough,
ass.), L. V. Melendez and J. L. Melnick. *Inter-*
rology 3(3):175-192, 1974.

ie more than 20 different herpesviruses of non-human
imates identified in recent years are being used
icreasingly as models for studies of human disease
iused by herpesviruses. This report presents a sum-
irized description of the isolation, cultural char-
teristics, host range, and serological properties
herpesviruses from Old World and New World mon-
ys. The viruses are classified into three groups:
iruses (A) which are readily released in active form
om cells, exhibit a wide host range in cell cul-
ire, and grow rapidly in cell culture; viruses (B)
iich are highly cell-associated, grow slowly, and
ive a narrow cell culture host range; and viruses
ntermediate) which grow in a relatively wide vari-
y of cells in culture but grow slowly and are slow-
released. Group A viruses include *Hepresvirus B*,
8, *Herpesvirus T*, and Spider monkey herpesvirus.
oup B viruses are SA6, African green monkey cyto-
galovirus, Liverpool vervet monkey virus, Patas
nkey herpesvirus, Rhesus monkey cytomegalovirus,
dical Lake Macaque herpesvirus, Leukocyte-asso-
ated herpesvirus, tree shrew herpesvirus, and owl
nkey cytomegalovirus. The intermediate group in-
udes *H. saimiri*, *H. saguinus*, *H. aotus* type 1,
aotus type 2, *H. aotus* type 3, *H. ateles*, and AT-
. *H. saimiri* and *H. aetles* have become important
r studies in experimental oncology; these viruses,
ich can produce malignant lymphomas and leukemia
several primate species, show similarities in
eir *in vivo* and *in vitro* behavior to human Epstein-
rr virus. (69 references)

09 MURINE LEUKEMIA VIRUSES (MuLV). *(Fr.)* Du-
plan, M. J. F. (No affiliation). *Bordeaux*
d 7(11):1753-1765, 1974.

eories of the mechanism of action of murine leukemia
iruses (MuLV) are reviewed, based on either the pro-
rus or protovirus hypothesis. Such viruses would
part of the cellular genome and activated by car-
nogenic factors through either triggering of repli-
tion of an actively carcinogenic virus (germinal or
ovirus theory) or a gene that responds to carcino-
is by derepressing a cancerous growth function which
repressed in a normal cell. Morphological charac-
ristics and culture of 12 different MuLV are re-
ewed together with their antigenic groups, murine
st compatibilities and murine cell surface antigens
duced by the specific MuLV infection. Possible re-
tions to human leukemias are discussed. (66 refer-
ces)

10 IMMUNOLOGIC DIAGNOSIS OF HUMAN CANCERS.
(E.) Shuster, J. (Montreal Gen. Hosp.,
nada), A. Livingstone, C. Banjo, H. K. B. Silver,
O. Freedman and P. Gold. *Am J Clin Pathol* 62(2):
3-257, 1974.

mor antigens defined by the immunization of hetero-
gous species include carcinoembryonic antigen (CEA)
and α_1-fetoprotein (AFP). The molecular structure of these antigens is discussed together with their use in the diagnosis and management of patients with tumors of the digestive system and the liver, resp. Serum CEA levels are highest in patients with colonic and rectal cancers, and the incidence of detectable CEA correlates well with the clinical staging of these tumors. Determination of CEA values in the postoperative period has prognostic value since levels return to normal following resection of potentially curable lesions (stage A, B, and C) but remain the same or increase in patients with advanced disease (stage D). Elevated serum CEA levels are also found in ulcerative colitis and Crohn's disease, both of which are associated with a relatively high incidence of malignant transformation, and in nonenteric neoplasms including cancers of the breast, lung, ovary, and bladder, as well as neuroblastomas. In tumor diagnosis, CEA radioimmunoassay is a useful adjunct to the usual diagnostic procedures. A positive test for CEA should be regarded as an abnormal event and an indication for close patient surveillance. Disorders associated with elevated serum AFP are hepatoma, teratoblastoma, viral hepatitis, and chronic active hepatitis. In both chronic active and acute viral hepatitis, the appearance of AFP appears related to increased SGOT levels and the nature of the hepatic injury. AFP levels are low in some patients with other benign hepatic disorders or with neoplasms of the stomach, pancreas, and lung. AFP is present in the sera of 86% of patients with hepatomas, indicating the usefulness of AFP radioimmunoassay as a diagnostic index of hepatocellular malignancy. Maternal serum AFP concentrations may be a nonspecific index of the state of health of a fetus. It is suggested that patients with chronic active hepatitis who are both AFP and Australia antigen positive may be at greater risk to develop hepatomas than patients negative for both antigens or positive for AFP only. (30 references)

5411 IMMUNOLOGIC CONSIDERATIONS OF CARCINOMA OF THE PROSTATE. *(E.)* Guinan, P. (Cook County Hosp., Chicago, Ill.), I. M. Bush, N. Sadoughi, K. Mallick and R. J. Ablin. *Prog Exp Tumor Res* 19:353-368, 1974.

Immunobiologic studies of the human prostate which may have some bearing on the diagnosis, prognosis, and treatment of carcinoma of the prostate are reviewed. Humoral factors considered are serum proteins, immunoglobulins and complement (C'3), antinuclear and bile-canalicular antibodies, circulating and cell-bound antibodies to prostatic tissue, antibodies to lymphocytes, tissue-specific antigens, carcinoembryonic antigen, isoantigens A, B, and O (H), and *in vivo* binding of immunoglobulins. Cellular factors considered are lymphocyte transformation and delayed-type hypersensitivity. Initial, favorable reports of immunotherapy for carcinoma of the prostate are briefly summarized. (79 references)

5412 EFFECTS OF THE FRIEND LEUKEMIA VIRUS ON CELLS OF THE IMMUNE SYSTEM. *(E.)* Friedman, H. (Albert Einstein Med. Cent., Philadelphia, Pa.). *Isr J Med Sci* 10(8):1052-1074, 1974.

The nature and mechanism of immunosuppression by leukemogenic viruses were investigated using the Friend disease model as a prototype system. Mice infected with Friend leukemia virus (FLU) showed a profound depression of humoral immune responses to antigens such as sheep RBC and *Escherichia coli* lipopolysaccharide. The time of virus infection relative to the time of immunization was important, as was the dose of virus and the strain of mice infected. Studies on loci of immunosuppression indicated that antibody precursor cells, most likely B lymphocytes, are preferentially affected by the leukemia virus, rather than cells actively producing antibody. Transfer studies indicated that antibody precursor B cells to both sheep RBC and *E. coli* lipopolysaccharide were rapidly affected by FLV infection, whereas T lymphocyte function was either not depressed, or depressed only at a later time. The true primary antibody response to *Vibrio cholerae* somatic antigen was not impaired by FLV, but secondary responses to the cholera bacilla were depressed, suggesting that antigen-activated immune cells are more susceptible to virus-induced immunosuppression. Cellular immunity assayed *in vivo* and *in vitro* to allograft antigens and to mycobacteria was also depressed, although often only at a later time during the course of infection. Immunity to tumor virus-associated antigens was also affected by FLV infection in susceptible strains of mice. In contrast, FLV-resistant mice, which developed a temporary immunosuppression to sheep RBC, showed no depressed cell-mediated immunity to either mycobacterial or FLV antigens. It appears likely that the immunosuppressive effect of FLV infection on T cells, although less pronounced than the effects on B cells, is important with regard to the tumorigenic process. These studies indicate that further investigations on the nature and mechanism of susceptibility and resistance of immunological function in leukemia virus-infected hosts may provide valuable information concerning the complex interaction between immunosuppresive tumor viruses and the cells of the immune system. (43 references)

5413 B-CELL NEOPLASIA IN MAN. *(E.)* Salmon, S. E. (Univ. Arizona Coll. Med., Tucson) and M. Seligmann. *Lancet* 2(7891):1230-1233, 1974.

The various B-cell neoplasms are related to current knowledge of the normal B-cell system to give a unifying view of the diverse human neoplastic disorders arising from the B-cell series of immunocytes. As is reflected by their immunoglobulin product (whether cell bound or secreted), such neoplasms are almost always monoclonal. A hypothesis is proposed which related the various clinical syndromes to the normal pathway of B-cell differentiation. This hypothesis permits an understanding of the interrelation of chronic lymphocytic leukemia, the various lymphomas, plasma-cell tumors, and rarer variants. Many clinical manifestations of B-cell neoplasia can also be related to the specific antibody, secreted immunoglobulin, and/or non-immunoglobulin products of the tumor cells. Observations on the natural history of both experimental and clinical myelomatosis, as well as detailed studies on the kinetics of the proliferation of myeloma cells in man, have led to a "two-hit" hypothesis of the evolution of myeloma. In this scheme, the first hit is a triggering by specific antigen, leading to a required monoclonal expansion, while the second hit is the oncogenic event. Some benign monoclonal gammopathies seem to be examples of an unusually exuberant response to the first hit, whereas others seem to be minimal-deviation malignancies after the second hit. (23 reference

5414 COMMENTS ON THE NATURAL HISTORY OF HUMAN MAMMARY CANCER. *(E.)* McDivitt, R. W. (Univ. Utah Coll. Med., Salt Lake City). *Proc Fifth Symp Biol Characterization Hum Tumors* 1:164-170, 1973

In order to formulate a clear idea of the etiology of mammary cancer, an attempt is made to define the point of initiation of this neoplasia. The earliest acceptable histological markers are the *in situ* lesions within breast duct and lobules. There may be variation in the duration of *in situ* lobular carcinoma prior to invasion (in some instances more than 20 yr) and in the rate with which primary breast cancers are capable of increasing their size. Data relevant to primary tumor size and propensity for axillary metastases are presented. Twenty-yr post-mastectomy survival rates correspond generally to the extent of axillary metastases. Cumulative risk of death from surgically treated breast carcinoma during the fifth yr through the 20th postmastectomy yr exceeds that incurred during the first five yr after treatment. Peak mortality for what has been called early breast cancer (small infiltrating cancers, and those which have not yet metastasized to the axilla), occurs still later in the follow-up period than peak mortality of treated breast carcinoma in general. The cumulative mortality for untreated invasive breast carcinoma is proportional to time at risk, the mean survival from time of diagnosis being relatively short (just under three yr), although some patients with breast carcinoma remain alive 10-15 yr after diagnosis without treatment. Five major histological categories of infiltrating breast cancer which connote differences in behavior are reported and the postsurgical survival rates discussed. A few factors which seem to affect cancer risk or affect the apparent clinical evolution of the carcinoma are reviewed, including age at first pregnancy, oophorectomy prior to the 40th birthday, family history, and cancer of other organs. It is concluded that mammary carcinoma is a neoplasm which may require considerable time in inception; the course of the disease may be so prolonged as to require decades to observe its progression fully. (23 references)

5415 NEOPLASIA: A SOMATIC MUTATION OR A HERITABLE CHANGE IN CYTOPLASMIC MEMBRANES? *(E.)* Pitot, H. C. (Med. Sch., Univ. Wisconsin, Madison). *J Natl Cancer Inst* 53(4):905-911, 1974.

An attempt is made to correlate the natural biologic history of the pathogenesis of neoplastic development *in vivo* with the presumed critical biochemical or molecular biologic changes associated with this pathogenesis. Genetic and epigenetic theories of neoplasia are analyzed. Two classes of neoplasms are postulated to exist: highly differentiated neo-

asms that are the direct progeny of the initiated
ll and those with a stable new phenotype result-
; from membrane alterations associated with al-
ed stabilities of messenger RNA. In the latter
lls, the membrane alterations producing heritable
enotypic changes may not lead to the enhancement
growth potential seen in grossly visible neoplasms.
st highly differentiated neoplasms exhibiting en-
nced growth potential would be expected to progress
the promoted stage, defined as biologically malig-
nt and with karyotypic changes resulting from gene
ltiplicities or deletions. Many neoplasms pro-
ced by carcinogenic agents appear to exhibit karyo-
pic abnormalities in their earliest definable cell
pulations; thus, the initiating stage may be by-
ssed, depending on the dosage of the inciting agent
d its general effects on the cell. It is argued
at the transition from the initiated to the pro-
ted stage may be related to heritable changes in
mbrane structure which in turn alter the normal
quences of chromosome DNA synthesis and mitosis
the replicating cell. (94 references)

16 THE INTESTINAL CELL SURFACE: SOME PROPER-
TIES OF NORMAL, UNDIFFERENTIATED, AND
LIGNANT CELLS. *(E.)* Isselbacher, K. J. (Harvard
d. Sch., Boston, Mass.). *Ann Intern Med* 81(5):
1-686, 1974.

e isolation of the microvillus and basolateral
rtions of the intestinal cell has made possible
better understanding of the structure and function
these surface components. The microvillus mem-
anes contain both hydrolytic (disaccharidases,
peptidases) and synthetic enzymes (glycosyltrans-
rases) and possess the carrier proteins involved
sugar and amino acid transport. Membrane vesicles
ve been used to show the presence of such carriers
the membrane. Most of the adenylate cyclase ac-
vity appears to be in the basolateral rather than
microvillus membranes. In contrast to villus
lls, the undifferentiated, mitotically active
ypt cells are not active in transport and their
rface glycoproteins are incomplete. Furthermore,
e surface membranes of crypt cells also have high
lactosyltransferase activity and are agglutinated
concanavalin A. These surface properties of crypt
lls are strikingly similar to those of fetal and
lignant cells. (24 references)

17 FUNCTIONAL MEMBRANE CHANGES AND CELL
GROWTH: SIGNIFICANCE AND MECHANISM. *(E.)*
rdee, A. B. (Dep. Biochem. Sci., Princeton Univ.,
J.), L. de Asua and E. Rozengurt. *Cold Spring Har-*
Conf Cell Proliferation 1:547-561, 1974.

periments on fibroblasts suggest that uncontrolled
owth leading to malignancy is brought about by per-
nent transformation of the cell surface (as is
used by some viruses). Transient release of growth
ntrol due to actions of extracellular agents such
serum is suggested to result from temporary sur-
ce changes. These agents rapidly shift the mem-
ane from an extreme state typical of nongrowing
lls toward a state found in transformed cells.
ese surface changes in turn inhibit adenyl cyclase
and lower cyclic AMP concentrations inside the cell. Low cyclic AMP increases transport of critical compounds through the membrane. Although transport can limit the availability of compounds from the medium, it is unlikely that nutrients limit growth by inadequately making substrates available for metabolism. Growth control is probably exerted at a specific restriction point in G_1. This specificity would not be expected from simple nutritional deprivation; rather, it is proposed that when a crucial component from the medium drops below a critical internal concentration, it functions to halt a specific cell cycle process at the restriction point. Control in cell growth is postulated to have evolved so that an allosteric control comes into play when extracellular conditions are appropriate in terms of the entire organisms. It is shown that control of cell division is based on a sequence of positive and negative controls, and is much more complex than initially imagined. (48 references)

5418 TRANSPORT OF NUCLEOSIDES, NUCLEIC ACID BASES, CHOLINE AND GLUCOSE BY ANIMAL CELLS IN CULTURE. *(E.)* Plagemann, P. G. W. (Med. Sch., Univ. Minnesota, Minneapolis) and D. P. Richey. *Biochim Biophys Acta* 344(3/4):263-305, 1974.

The plasma membrane of animal cells constitutes a mosaic of many different transport systems and other functional sites such as receptors for hormones, growth factors, and inhibitors. Studies on the *in vitro* transport of nucleosides, purines and pyrimidines, choline, and monosaccharides by animal cells are reviewed. Zero-trans and countertransport (exchange diffusion) procedures for measuring transport rates are summarized. Information is presented on substrate uptake by an unsaturable process, on the kinetics of the transport systems, on transport inhibition and inactivation, and the nature of the transport process, and on alterations in transport rates. The data demonstrate that each transport system exhibits its own substrate specificity and kinetic properties. The physiological significance of the magnitudes of the transport K_m values is not known, but may reflect the concentrations of natural substrates in body fluids. Regardless of their origin or time of propagation in culture, all cells exhibit similar K_m values for the transport of specific substrates. Intriguing changes in transport rates for various substrates have been observed during density-dependent inhibition of growth or serum deprival of normal cells, during stimulation of their growth by various treatments, and as a result of their transformation by tumor viruses. The finding that the various transport systems do not change in a coordinated fashion either as the result of treatment such as serum stimulation, or during traverse through the cell cycle, makes it difficult to envisage the action of a single mediator in regulating many transport processes. In general, transport changes do not seem to reflect qualitative changes in the affinity of the transport system for substrate, but rather changes in the number of efficiency of functional transport sites in the membrane. Sulfhydryl groups are apparently essential for cell transport processes, but their specific role is unknown. Recent evidence suggests that the physical state of the membrane lipids in the environment of the transport system critically influences transport capacity; this should be taken into account in any molecular model of transport processes. Since transport is the rate-limiting step in the phosphorylation of the substrate, transport may be a logical target for the regulation of metabolism and growth. (234 references)

5419 LEUKEMIA AND SARCOMA VIRUSES IN CATS. *(E.)* Parodi, A. L. (Natl. Sch. Vet. Med., Maisons-Alfort, France). *Medicina (B Aires)* 34(1): 61, 1974. (No references)

5420 ANATOMOPATHOLOGIC AND EPIDEMIOLOGIC CHARACTERISTICS OF LEUKEMIA AND HAEMATOSARCOMA IN DOMESTIC MAMMALS. *(E.)* Parodi, A. L. (Natl. Sch. Vet. Med., Maisons-Alfort, France). *Medicina (B Aires)* 34(Suppl. 1):74, 1974. (No references)

5421 BIOLOGICAL ASPECTS OF PITUITARY TUMORS AS REVEALED BY ELECTRON MICROSCOPY. *(E.)* Landolt, A. M. (Neurosurg. Clin., Univ. Zurich, Switzerland) and H. U. Hosbach. *Pathologica* 66(961/962):413-436, 1974. (44 references)

5422 A REVIEW OF PHOTODYNAMIC THERAPY FOR HERPES SIMPLEX: BENEFITS AND POTENTIAL RISKS. *(E.)* Bockstahler, L. E. (Bur. Radiol. Health, Rockville, Md.), C. D. Lytle and K. B. Hellman. 30 pp., 1974. [Obtained through National Technical Information Services, Washington, D. C. Document No. PB-240 460/6WJ]. (No references)

5423 BACTERIA AND CANCER. *(E.)* Marcenac, F. M. L. (Gral. San Martin Univ. Hosp., Buenos Aires Univ., Argentina). *Medicina (B Aires)* 34(Suppl. 1): 44-45, 1974. (No references)

5424 HIGH RISK GROUPS, DEFINITION AND RECOGNITION BY CHROMOSOME ABERRATIONS. *(E.)* Fischer, P. (Vienna Cancer Inst., Austria) and E. Hebrard. *Cancer Cytol* 14(2):16-20, 1974. (16 references)

5425 PRECANCERS, CANCERS AND LYMPHOMA-LEUKEMIA; EXPERIMENTAL TUMORIGENESIS. *(E.)* Anonymous. *Yearb Dermatol* pp. 180-209, 1974. (66 references)

5426 RECENT PROGRESS IN STUDIES OF MOUSE TYPE-C VIRUSES. *(E.)* Sarma, P. S. (Natl. Cancer Inst., Bethesda, Md.) and A. F. Gazdar. *Curr Top Microbiol Immunol* 68:1-28, 1974. (186 references)

5427 CARCINOEMBRYONIC ANTIGENS. *(E.)* Koldovsky, P. (Child. Hosp. Philadelphia, Pa.). *Recent Results Cancer Res* 45:1-70, 1974. (411 references)

5428 PRECANCER AND CARCINOMA *IN SITU* OF THE LARYN FEATURES OF THE PATHOLOGICAL ANATOMY. *(It.)* Pizzetti, F. (Natl. Inst. Cancer Res. Treatment, Milan, Italy). *Tumori* 60:467-470, 1974. (No references)

5429 ASBESTOS PROPERTIES AND MESOTHELIOMA PRODUCTION. *(E.)* Anonymous. *Food Cosmet Toxicol* 12(4):591-592, 1974. (2 references)

5430 SUBCELLULAR REACTIONS OF ACROLEIN. *(E.)* Anonymous. *Food Cosmet Toxicol* 12(4): 578-579, 1974. (2 references)

5431 NITROSAMINE SYNTHESIS *IN VIVO*. *(E.)* Anonymous. *Food Cosmet Toxicol* 12(1): 156-158, 1974. (3 references)

5432 IMMUNOLOGICAL ASPECTS. *(E.)* Bachmann, A. E. (Natl. Acad. Med., Buenos Aires, Argentina). *Medicina (B Aires)* 34(Suppl. 1):50-52, 1974. (No references)

5433 CANCER AND MYCOSIS. *(E.)* Negroni, P. (Fac. Med., Univ. Buenos Aires, Argentina). *Medicina (B Aires)* 34(Suppl. 1):49, 1974. (No references)

5434 SEROEPIDEMIOLOGIC STUDIES ON BOVINE LEUKEMIA. *(E.)* Marshak, R. R. (Univ. Pennsylvania, New Bolton Cent.). *Medicina (B Aires)* 34(Suppl. 1):73, 1974. (No references)

5435 VIRAL ETIOLOGY OF HUMAN LEUKEMIA. *(E.)* Peries, J. (Hosp. St. Louis, Paris, France). *Medicina (B Aires)* 34(Suppl. 1):71-72, 1974. (No references)

5436 *HERPESVIRUS ATELES*: *IN VITRO* AND *IN VIVO* BEHAVIOUR. *(E.)* Melendez, L. V. (Harvard Med. Sch., Boston, Mass.). *Medicina (B Aires)* 34(1): (Suppl. 1):70, 1974. (No references)

5437 EVALUATION OF THE CARCINOGENESIS OF SV 40 IN HUMANS INOCULATED WITH POLIOMYELITIS VACCINE CONTAMINATED BY THE VIRUS. *(E.)* Suarez, H. G. (Inst. Cancer Res., Villejuif, France). *Medicina (B Aires)* 34(Suppl. 1):68-69, 1974. (No references)

5438 PAPOVA GROUP VIRUSES RELATED TO HUMAN PATHOLOGY. *(E.)* de Torres, R. (Fac. Pharm. Biochem., Univ. Buenos Aires, Argentina). *Medicina (B Aires)* 34(Suppl. 1):66-67, 1974. (No references)

5439 THE FORMATION AND KINETICS OF REACTIVE DRUG METABOLITES IN MAMMALS. *(E.)* Uehleke, H. (Inst. Pharmacol., Univ. Tubingen, W. Germany). *Mutat Res* 25(2):159-167, 1974. (46 references)

0 PROBLEMS IN TRANSPLACENTAL CARCINOGENESIS. *(Ger.)* Zeller, W. J. (Inst. Toxicol. mother., German Cancer Res. Cent., Heidelberg, W. many). *Geburtshilfe Frauenheilkd* 34(12):1001-1006, 4. (34 references)

1 MEDULLARY CANCER WTIH AMYLOID STROMA AND DIFFUSE ENDOCRINE SYSTEM. *(Fr.)* Pages, A. b. Pathoanat., Univ. Hosp., Montpellier, France). *Endocrinol (Paris)* 35(4):469-479, 1974. (12 erences)

2 ALPHA-FETOPROTEIN (AFP) IN NORMAL AND PATHOLOGICAL STATES. *(Pol.)* Kraj, M. (Clin. atol., Inst. Hematol., Warsaw, Poland). *Postepy Med Dosw* 28(6):901-909, 1974. (78 references)

3 FOETAL ANTIGENS AS INDICATORS OF HUMAN NEOPLASMS. *(Pol.)* Kraj, M. (Clin. Hematol., t. Hematol., Warsaw, Poland). *Postepy Hig Med w* 28(6):911-922, 1974. (72 references)

4 CONTROL OF RNA SYNTHESIS: MECHANISM OF HORMONAL REGULATION. *(Sp.)* Castells, S. wnstate Med. Cent., New York State Univ., New York, Y.). *Rev Iber Endocrinol* 21(126):513-531, 1974. references)

5445 EXTRATHORACIC ASBESTOS CARCINOMAS. *(Ger.)* Anspach, M. (Silicosis Monitoring Cent., Dresden, East Germany). *Radiobiol Radiother (Berl)* 15(2):253-257, 1974. (No references)

5446 CYTOGENETICS OF THE NEOPLASTIC CELL. *(Pol.)* Wisniewski, L. (Inst. Obstet. Gynec., Med. Acad., Bialystok, Poland) and H. Lech. *Folia Med Bialostoc* 3:17-21, 1974. (15 references)

5447 THE MUTAGENIC EFFECT OF X-RAYS. II. EFFECT ON THE MUTATION RATE. *(Ger.)* Stephan, G. (Dep. Radiat. Hyg., Fed. Health Service, Berlin, W. Germany). *Roentgenblaetter* 27(7):348-354, 1974. (13 references)

5448 IMMUNITY TO CANCER: USE OF SPONTANEOUS TUMORS FROM DOMESTIC ANIMALS AS MODELS FOR RESEARCH. 1. *(Fr.)* Anonymous. *Bull WHO* 50(6): 537-548, 1974. (31 references)

5449 IMMUNITY TO CANCER: USE OF SPONTANEOUS TUMORS FROM DOMESTIC ANIMALS AS MODELS FOR RESEARCH. 2. *(Fr.)* Anonymous. *Bull WHO* 50(6): 549-558, 1974. (54 references)

5450 MUTAGENESIS IN CULTURED HUMAN DIPLOID CELLS. I. EFFECTS OF SOME MUTAGENS AND A SELECTIVE AGENT ON CELL SURVIVAL.

(E.) Kuroda, Y. (Dep. Morphol. Genet., Natl. Inst. Genet., Misima, Shizouka, Japan). *Jpn J Genet* 49(6):379-387, 1974.

Using human diploid cells derived from a 5-month embryonic lung, the optimal culture conditions for colony formation (plating efficiency) and the effects of two chemical mutagens [ethyl methanesulfonate (EMS) and N-methyl-N'-nitro-N-nitrosoguanidine (MNNG)] and a selective agent [8-azaguanine (8AG)] on the plating efficiency were studied. Among the various media tested, Ham's medium F12 supplemented with 10% calf serum gave the highest plating efficiency, followed by Eagle's basal medium and Eagle's minimum essential medium, each supplemented with 10% calf serum, and Puck's medium N16CF and Puck's medium F16 with 10% calf serum. The effects of various concentrations of EMS, MNNG, and 8AG on the plating efficiency of the cells were tested and mean lethal dose (D_o) values were calculated from the concentration-survival curves. The D_o value for 14 days of treatment with EMS was 9.6×10^{-4} M, while the D_o values for 2-hr and 14-day treatments with MNNG were 1.2×10^{-5} M and 1.1×10^{-5} M, respectively. The D_o values for a 14-day treatment with 8AG was 0.73 µg/ml (4.8×10^{-6} M).

5451 BONE MARROW AND THYMUS REGENERATION IS A CONDITION FOR THYMOMA DEVELOPMENT.

(E.) Frei, J. V. (Fac. Med., Univ. Western Ontario, London, Canada) and S. C. Maitra. *Chem Biol Interact* 9(1):65-69, 1974.

The effects of methyl methanesulfonate, ethyl methanesulfonate, *N*-methyl-*N*-nitro-*N*-nitrosoguanidine (MNNG), and *N*-ethyl-*N*-nitrosourea (ENUA) were studied in inbred Swiss mice to explain why they do not follow an association pattern of thymoma and 0^6-alkylguanine-induction as do other alkylating agents. Degeneration and regeneration of bone marrow in mice were analyzed by changes in nucleated cell count and in thymus and spleen weights at 0.1, 3, 6, 10, 15, or 20 days. After a single sublethal i.p. injection ENUA, which induces thymoma, produced the maximum loss of tissue in all three organs examined. The other compounds, which do not induce thymomas, did not give significant changes in any of the organs examined. The results show that bone marrow and thymus degeneration followed by regeneration are essential for thymoma development by alkylating carcinogens.

5452 EFFECT OF MUTAGENS ON BUdR RESISTANCE IN HAPLOID CELLS: GENETIC OR EPIGENETIC?

(E.) Mezger-Freed, L. (Inst. Cancer Res., Philadelphia, Pa.). *Biochem Dis* 4(Part B):591-603, 1974.

Bromodeoxyuridine (BUdR)-resistant variants were isolated from a haploid cell line established from a *Rana pipiens* embryo. Resistance to BUdR was not the result of classic thymidine kinase deficiency in which the absence of the enzyme prevents a lethal incorporation of BUdR into DNA. The average enzyme activity of nine haploid isolates was 67% of the value for the parental line. Instead, resistance was correlated with a greatly decreased uptake of thymidine or BUdR. Treatment with mutagens was not consistent with expectations for mutation. None of 13 BUdR-resistant wild-type haploid cells was thymidine kinase-deficient. Thymidine kinase-deficient isolates (activity 5% of that in the parental line) were obtained from the transport-deficient lines. In these lines, resistance to BUdR was 3-4-fold higher than in transport-deficient cells. Evidence that the loss of thymidine kinase activity was epigenetic and not genetic is the absence of the variants at the beginning of selection, the requirement for transport-deficient precursors, the fact that clones derived from a single colony differed in their competence for developing the enzyme deficiency, and the subsequent correlation of this competence with transport deficiency and ICR 191 recovery. The lack of real thymidine kinase mutants suggests that evolution may have provided somatic cells with effective mechanisms against the expression of gene mutation.

5453 STRUCTURAL AND FUNCTIONAL CHANGES IN NUCLEIC ACIDS MODIFIED BY CHEMICAL CARCINOGENS.

(E.) Weinstein, I. B. (Columbia Univ. Coll. Physicians Surg., New York, N.Y.) and D. Grunberger. *Biochem Dis* 4(Part A):217-235, 1974.

A base displacement model for the covalent binding of the liver carcinogen, N-2-acetylaminofluorene (AAF), to tRNA has been proposed. Experimental evidence from model building, spectroscopy, tRNA template activity and nucleic acid denaturation and RNA-DNA hybridization studies is presented to support the following predictions of the model: 1) binding of AAF to the 8-position of guanosine with rotation of the glycosidic bond from the anti to the syn conformation; 2) displacement of the AAF-bound guanosine moiety making it unavailable for base pairing; 3) stacking interaction between the fluorene residue of the bound AAF and one of the adjacent nucleic acid bases which may interrupt base pairing ability of the neighboring base; 4) greater susceptibility to AAF modification of guanine from single-stranded regions of nucleic acid than from double-stranded regions; 5) localized denaturation of double-stranded nucleic acids at the site of AAF binding due to disruption of base pairing and associated conformational changes. The base displacement model also predicts that AAF substitution could cause analogous defects in nucleic acid replication during the process of DNA transcription into RNA or during reverse transcription of RNA into DNA.

5454 MODIFICATION OF RIBONUCLEIC ACID BY CHEMICAL CARCINOGENS. VI. EFFECT OF *N*-2-ACETYLAMINOFLUORENE MODIFICATION OF GUANOSINE ON THE CODON FUNCTION OF ADJACENT NUCLEOSIDES IN OLIGONUCLEOTIDES.

(E.) Grunberger, D. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.), S. H. Blobstein and I. B. Weinstein. *J Mol Biol* 82(1):459-468, 1974.

To determine if a nucleoside adjacent to an *N*-2-acetyl aminofluorene-modified guanosine residue in an oligonucleotide could function as part of a codon, tri- and tetra-nucleotides were tested for their

lity to stimulate ^{14}C-labeled amino acyl-t-RNA
ding to ribosomes. Following the reaction of the
gonucleotides with *N*-acetoxy-2-acetyl amino fluo-
e (3.3 mM), the modified oligonucleotides were
arated from the unreacted material by benzoylated
thyl aminoethylcellulose chromatography. The
odified oligonucleotides were eluted with 1.3 M
onium bicarbonate in 30% ethanol. The effects
the modification were: if the guanosine residue
which the drug is covalently bound is part of a
on, the oligonucleotide was completely inactive
the ribosomal binding assay; if an adenosine
idue was adjacent to either the 5' or 3' side of
modified guanosine, as in $(Ap)_3G$ or $G(pA)_3$, there
partial inhibition of ^{14}C-labeled lysyl-tRNA
ding to ribosomes. This inhibitory effect extend-
only to the function of the immediately adjacent
nosine, since the chemical modification of guano-
ce residues in $(Ap)_4G$ or $G(pA)_4$ did not impair
ir ability to code for lysine. If there was a
dine residue adjacent to the modified guanosine,
in $(Up)_3G$ or $G(pU)_3$ there was no effect on ^{14}C-
eled phenylalanyl-tRNA binding of ribosomes. Pro-
magnetic resonance spectra of UpG, GpU and the
responding dimers in which the guanosine residue
modified with the drug failed to indicate a
cking interaction between the fluorene moiety and
adjacent uridine residue. The stacking inter-
ion with adjacent adenosine, and not with adjacent
dine residues, in oligonucleotides probably
ounts for the effects observed in the ribosomal
ding assay. These results indicate that acetyl-
nofluorene modification of guanosine next to an
nosine residue in an oligonucleotide inhibits its
osomal binding capacity.

55 HALF-LIFE OF N-ACETYLNEURAMINIC ACID IN PLASMA MEMBRANES OF RAT LIVER AND MORRIS
ATOMA 7777.

(E.) Harms, E. (Inst. Biochem., Univ.
iburg, West Germany) and W. Reutter. *Cancer Res*
12):3165-3172, 1974.

half-life of protein-bound *N*-acetylneuraminic
d (NANA) was studied in rat liver and Morris
atoma 7777. Male buffalo rats (150-200 g) were
ad libitum; Morris hepatoma 7777 was transplanted
. in both rat hind legs every three weeks. The
mals were killed by exsanguination. Plasma
branes of hepatoma were isolated according to a
ified method; plasma membrane fractions of liver
e also determined. The following enzyme markers
e assayed: 5'nucleotidase, Mg^{++} : Ca^{++}-ATPase,
:K^{+}-ATPase, succinate dehydrogenase and glucose-6-
sphatase. *N*-Acetyl-D-mannosamine was the most
table precursor of protein-bound NANA. When com-
ed to the use of free NANA of a comparable specific
ioactivity, the rate of incorporation was six times
her in liver and 20 times higher in hepatoma. There
no difference between the half-lives of NANA of
liver and hepatoma membranes. The same applied
total liver and hepatoma protein. However, in
h tissues the half-life of plasma membrane-bound
A was shorter (liver 22.2 - 24 hr; host liver,
5 hr; hepatoma 23.7 hr) than the half-life of total
tein-bound NANA (liver, 34 hr; host liver, 30.1 hr;
atoma, 33.9 hr). This finding indicates that
loproteins with considerably longer half-lives of
NANA exist in subcellular structures other than the plasma membranes. The half-lives of NANA in plasma membranes were much shorter than the half-lives of amino acids when a non-reutilizable amino acid precursor was used. It may be concluded that the mean turnover of NANA is more rapid than the turnover of amino acids in plasma membranes. Glycosylation by plasma membrane-bound glycosyltransferses or different turnover rates of plasma membrane compounds is regarded as responsible for the shorter half-life of plasma membrane-bound NANA.

5456 COMPARATIVE STUDIES ON LYSOSOMAL ACTIVITIES IN MYCOTOXIN-TREATED BIRD EMBRYOS.

(E.) Adekunle, A. A. (Dep. Biochem. Physiol., Univ. Ibadan, Nigeria) and R. A. Elegbe. *Environ Physiol Biochem* 4(6):289-293, 1974.

The effect of aflatoxin B_1 on the livers of five species of bird embryos was investigated in order to establish that lysosomal integrity of aflatoxin-treated animals is species-dependent. Aflatoxin B_1 in doses of 0 to 0.6 μg/egg in 0.05 ml propylene glycol was introduced into the yolk sac of the embryos of domestic fowl (*Gallus domesticus*) of White Rock breed; duck (*Cairina moschata,* Muscovy); guinea fowl (*Numida meleagris*, Kano); domestic pigeon (*Columbia livia*, Locale) and turkey (*Meleagris gallipavo*, Sokoto) after nine days of incubation. Homogenates of the liver were made from birds hatching from 2-2.5 weeks after treatment. The acid phosphatase activity was determined by measuring the amount of inorganic P set free in the presence of 0.05 M β-glycerophosphate and 0.05 M acetate buffer adjusted to pH 5.0 with HCl. Lysosomes of animals treated with aflatoxin B_1 *in vivo* showed evidence of leakage as judged by specific activities of two marker enzymes, acid phosphatase and β-glucuronidase. The modes of leakage varied from one species to another. They were significant in domestic fowl and guinea fowl, but not in duck, domestic pigeon or turkey embryos. A slight increase in the lysosomal enzyme activity of duck, domestic pigeon which leads to the observed high mortality in these three species. In the same family of different species the percentage increase in lysosomal activity induced in intoxicated livers may vary from one species to the other. The results support the idea that hepatocellular changes produced by aflatoxin in birds are mediated through primary damage to lysosomes.

5457 ACTION OF HALOGENOMETHYL HYDROCARBON DERIVATIVES ON *IN VITRO* DNA AND RNA SYNTHESIS, AND ON tRNA PROPERTIES. RELATIONSHIP WITH CARCINOGENIC POTENCY OF METHYL PARENT HYDROCARBONS.

Buu-Hoi, N. P. (Chem. Inst. Nat. Subst., Natl. Cent. Sci. Res., Gif-sur-Yvette, France), M. Croisy-Delcey, P. Jacquignon, C. Chayet, P. Daudel, F. Gachelin, A. Jacquier, G. Lataillade and J. Moreau. *Biochem Dis* 4(Part A):159-176, 1974.

The effects of various halogenomethyl derivatives on *in vitro* synthesis of rat liver DNA and RNA and on *in vitro* properties of tRNA were studied. Comparison of the carcinogenic activity of the parent compounds of 14 bromo- and chloromethyl derivatives with the ability of the derivatives to inhibit ^{3}H-dTMP incorporation into DNA or ^{14}C-AMP into RNA showed good and perfect correlations, resp., between the two phenomena. Similar results were obtained with nucleoprotein templates in which a carcinogenic bromoderivative inhibited ^{14}C-AMP incorporation into RNA whereas a noncarcinogenic derivative did not. Binding of the carcinogenic derivative appeared to be preferentially to nucleic acid since DNA extracted from treated nucleoprotein was also a poor template for RNA synthesis and since carcinogen exposure had no effect on egg white lysozyme activity. In a crude system, 7-bromomethyl aromatic hydrocarbons showed a dose-dependent inhibition of tRNA template activity which was twice as great for the carcinogenic derivatives. Based on results of other studies, the simplest interpretation of the present results is that the carcinogenic methylaromatic hydrocarbons form a type II cation which inhibits nucleic acid synthesis.

5458 SPECIFIC ESTROGEN RECEPTOR AND ITS RELATION TO RESPONSE TO OOPHORECTOMY IN RAT MAMMARY CANCER INDUCED BY 7,12-DIMETHYLBENZ(A)ANTHRACENE.

(E.) Nomura, Y. (Natl. Kyushu Cancer Cent. Hosp., Japan), Y. Abe and K. Inokuchi. *Gann* 65(6):523-528, 1974.

The specific binding capacity of the estrogen receptor to tritiated estradiol was measured in 7,12-dimethylbenz(a)anthracene (DMBA)-induced rat mammary cancers and compared with the response to oophorectomy. The tumors were induced in female Sprague-Dawley rats. The bound radioactivities of 14 concentrations of tritiated estradiol with a fixed amount of 2,000 g tumor supernatant were separated from the free activities using a dextran-coated charcoal method. The specific binding capacity of each tumor was then estimated with the aid of the association constant (Ks) and the concentration of free binding sites (Ns) obtained by Baulieu's proportion graph method. The estrogen receptor was found by this method in 19 of 30 tumors, with a mean Ks of 5.7×10^{10} g protein/M, and a mean Ns of 2.2×10^{-12} M/g. All of the 12 rats with hormone dependent (responsive to oophorectomy) tumors had estrogen receptors, as did six of nine animals whose tumors showed intermediate regression after oophorectomy. Eight of the nine animals whose tumors did not respond to oophorectomy had no estrogen receptors. Thus, a good correlation was obtained between the presence of estrogen receptors and a positive response of the mammary tumor to oophorectomy.

5459 CONVERSION OF CARCINOGENS RELATED TO 7,12-DIMETHYLBENZ(A)ANTHRACENE BY RAT LIVER HOMOGENATES TO THE CARCINOGENIC METABOLITE 7-HYDROXYMETHYL-12-METHYLBENZ(A)ANTHRACENE.

(E.) Couch, R. C. (Univ. Kentucky Coll. Med., Lexington), K. B. Fields and J. W. Flesher. *Res Commun Chem Pathol Pharmacol* 9(2):279-289, 1974.

The metabolism of 7-iodomethyl-, 7-benzoyloxymethyl- and 7-acetoxymethyl-12-methylbenz(a)anthracene by rat liver homogenates was studied. Liver homogenates from normal female Sprague-Dawley rats were incubated with the ^{14}C-labeled hydrocarbons, cofactors, and substrates; the reaction products were analyzed using thin-layer chromatography. Each of the carcinogens studied was converted to 7-hydroxymethyl-12-methylbenz(a)anthracene (7-hydroxy-DMBA). Although the presence of the rat-liver homogenate was required for the hydrolysis of 7-benzoyloxymethyl-12-methylbenz-(a)anthracene and 7-acetoxymethyl-12-methylbenz(a)-anthracene to 7-hydroxy-DMBA, 7-iodomethyl-12-methylbenz(a)anthracene could be converted to this product in its absence. This is in accord with the hypothesis that the latter carcinogen is a direct-acting alkylating agent which undergoes non-enzymic hydrolysis. The formation of 7-hydroxy-DMBA by all three carcinogens constitutes another link in the chain of evidence suggesting that 7-hydroxy-DMBA functions as a proximate carcinogen for these agents *in vivo*.

5460 CRYSTALLOGRAPHIC STUDIES OF K-REGION ARENE OXIDES: 7,12-DIMETHYLBENZ(A)ANTHRACENE-5,6-OXIDE AND PHENANTHRENE-9,10-OXIDE.

(E.) Glusker, J. P. (Ben May Lab. Cancer Res., Univ. Chicago, Ill.), H. L. Carrell and D. Z. Zacharias. *Cancer Biochem Biophys* 1(1):43-52, 1974.

The molecular structures of the carcinogenic K-region epoxides of 7,12-dimethylbenz(a)anthracene (7,12-DMBA) and phenanthrene were studied in detail. The θ-θ variable scan technique was used to obtain the three-dimensional X-ray diffraction characteristics of crystals of both compounds. The structure of the 7,12-DMBA-5,6-oxide was solved by direct methods using the program MULTAN and the structure of phenanthrene-9,10-oxide was solved from the Patterson map. The latter epoxide was found to be approximately planar (excluding the oxygen and hydrogen atoms of the epoxide ring), whereas the epoxide of 7,12-DMBA was nonplanar, with an angle of 35 degrees between the two most distant rings. This nonplanarity was also found in the parent compound, 7,12-DMBA, and is the result of steric repulsion between the 12-methyl group and the α-ring. The shape of the 7,12-DMBA oxide was compared with that of a steroid (progesterone) and that of a Watson-Crick base pair. The epoxide oxygen atom of one molecule of 7,12-DMBA oxide packed nearest to the C(7) of another molecule, indicating the probable site of maximum positive charge in the crystalline state. The results suggest that planarity is not a necessary criterion of carcinogenicity in these polycyclic aromatic hydrocarbons. In fact, the enhancement of carcinogenicity upon methylation of certain positions in the molecule may be, in part, a result of steric hindrance between hydrogen atoms forcing the molecule to be nonplanar. Apparent residual positive charge on the C(7) of the 7,12-DMBA-5-6-oxide may indicate a target area for nucleophilic attack.

5461 SKIN TRANSPLANTATION IN THE STUDY OF CHEMICAL CARCINOGENESIS: II. ISO- AND AUTO-GRAFTING OF SKIN FROM MICE INTRAGASTRICALLY INITIATED WITH 9,10-DIMETHYL-1,2 BENZANTHRACENE WITH AND WITHOUT SUBSEQUENT APPLICATION OF THE PROMOTING AGENT TPA.

(E.) Worst, P. K. M. (Dtsch. Krebsforsch., Inst. Exp. Pathol., Heidelberg, Germany) and R. Bauz. *Z Krebsforsch* 82(4):285-294, 1974.

determine whether an immunological surveillance chanism can act against tumor associated trans- pantation antigens (TATA) at the level of the poten- tal tumor cell, papilloma formation on syngeneic sin grafts was studied in inbred C3H mice treated wth 9,10-dimethyl-1,2-benzanthracene (DMBA carcino- gn) and, in some cases, with 12-0-tetradecanoyl- porbol-13-acetate (TPA, cocarcinogen). Mice initi- aed intragastrically with DMBA developed a large mber of papillomas on subsequent treatment with A. Skin from initiated mice could successfully be gafted to normal isologous recipients, the grafts rmaining in good condition for 8-12 months. Graft- ig had only a low tumor-promoting effect. It seemed t reduce the amount of initiated cells in the grafts s that the number of papillomas in initiated and atografted animals after TPA administration was lower tan in similarly treated but ungrafted controls. The icidence of papillomas on initiated autografts was hgher than on initiated isografts in normal recip- ints. The results disprove the hypothesis that the clls of carcinogen-treated skin as a whole might ac- qire new common transplantation antigens. The loss c initiating cells during grafting could be caused b a specific immune reaction, the local processes ring grafting allowing perhaps a more intense con- tct between the immune system and potential tumor clls. The higher incidence of papillomas on auto- gafts might then be due to immunosuppression in tese animals by the carcinogen. The optimal presen- ttion of tumor-associated transplantation antigens t the immune system might be one of the keys to un- rstanding why immunological surveillance may fail function.

52 THE EFFECT OF BENZOPYRENE AND METHYLCHOLANTHRENE ON THE ACTIVITY OF CERTAIN LYSO- AL ENZYMES IN THE SKIN OF WHITE "BN" AND BLACK B1 MICE IN THE INITIAL STAGE OF CARCINOGENESIS. *l.)* Drewa, G. (Acad. Med., Gdansk, Poland). *No- wory* 24(2):83-94, 1974.

nzene, 3,4-benzpyrene (BP) and 20-methylcholan- rene (MC) were applied (0.1 ml of a 3% benzene solu- n three times a week) for 6 weeks to the skin of -12 week old male and female albino "BN" and C57Bl e. The activity of arylsulphatase and cathepsin e determined after 1, 3, and 6 weeks and compared control values. The activity of both hydrolases pressed in μM tryosine/mg protein) increased af- the application of these polycyclic hydrocarbons, ecially in the black mice and especially after MC. black mice the highest activity of cathepsin (3.09 er BP, 3.49 after MC as compared to 2.4 in con- ls) and arylsulphatase (4.27 after BP, 4.91 after , 2.7 control) occurred after one week. In albino e the highest activity of cathepsin (3.77 after 4.56 after MC, 1.8 controls) occurred after three ks; of arylsulphatase (3.45, 3.47 and 2.25, resp.), er six weeks. There was no difference in activity ated to sex of the animals. Papillomas were in- ed with these hydrocarbons faster in albino than ck mice, and the activity of acid hydrolases was higher in papillomas than in the skin of un- ated mice. It is suggested that the higher ac- ity of lysosomal hydrolases in the skin of pig- ted mice is related to the presence of melanin, the larger number of lysosomes and the faster the rate of hydrolysis within the lysosomes.

5463 INVESTIGATIONS ON THE CARCINOGENIC BURDEN BY AIR POLLUTION IN MAN: IX. EARLY PATHOLOGICAL ALTERATIONS OF THE BRONCHIAL EPITHELIUM IN SYRIAN GOLDEN HAMSTERS AFTER INTRATRACHEAL INSTILLATION OF BENZO(A)PYRENE: 1. MORPHOLOGICAL STUDIES FROM SEMITHIN SECTIONS. *(E.)* Reznik-Schuller, H. (Abt. Exp. Pathol., Med. Hochsch. Hannover, Germany) and U. Mohr. *Zentralbl Bakteriol* [*Orig B*] 159(5/6): 493-502, 1974.

The early stages of benzo(a)pyrene (BP) carcinogenesis in the hamster lung were studied. Female Syrian Golden hamsters were treated intratracheally with 0.63 mg BP once weekly for life; the treatments began when the animals were 8 weeks old. Pathological changes occurring in the bronchi were examined 4-21 weeks after the beginning of BP administration. All morphological studies were performed using semithin tissue sections which allowed for the exact orientation of the tissues. After four weeks, the bronchial epithelium showed slight irregularities in cell orientation caused by focal cell proliferation in the immediate vicinity of the basement membrane. After seven weeks, advanced vacuolization in the cytoplasm of both goblet and ciliated cells was observed with marked condensation of the nuclear chromatin in many ciliated cells; desquamated epithelial cells and cellular debris were found in the lumina of some bronchi. Increased proliferation of epithelial and basal cells with the formation of 3-4-layered hyperplastic regions occurred up to 11 weeks. One week later, single epithelial cells began penetrating through the basement mambrane and process increased during week 13 and 14. From hyperplastic areas of the bronchial epithelium, cordlike structures composed of epithelial cells broke through the basement membrane into the lung tissues, later forming small acinar structures which developed into the first small bronchogenic adenomas between weeks 16 and 20. Squamous cell metaplasia in the bronchi and bronchioli was not observed.

5464 INVESTIGATIONS ON THE CARCINOGENIC BURDEN BY AIR POLLUTION IN MAN. X. MORPHOLOGICAL CHANGES OF THE TRACHEAL EPITHELIUM IN SYRIAN GOLDEN HAMSTERS DURING THE FIRST 20 WEEKS OF BENZO(A)PYRENE INSTILLATION: AN ULTRASTRUCTURAL STUDY. *(E.)* Reznik-Schüller, H. (Hannover Med. Sch., West Germany) and U. Mohr. *Zentralbl Backteriol (Orig B)* 159(5/6): 503-525, 1974.

Epithelial alterations occurring in the tracheae of Syrian golden hamsters treated once weekly for life with benzo(a)pyrene (0.63 mg dispersed in saline solution) were examined by electron microscopy during the first 20 weeks of treatment. Initial changes were basal cell proliferation, focal loss of cilia, and widening of intercellular spaces; these changes occurred at 5-6 weeks in the third tracheal ring and 1-2 weeks later in the sixth and 12th tracheal rings. Between weeks 7-8 many ciliated cells showed areas of cytoplasmic degeneration characterized by partially disrupted or swollen membranes. Nine to 10 weeks after treatment basal cell hyperplasia, with total loss of polarity and increased cell interdigitations, was present in all tracheal rings examined. These alterations, when examined only by light microscopy, should not be diagnosed at this stage as metaplasias since development of filamentous bundles and occurrence of keratohyaline granules, both indicators of a keratin-synthesizing potency, were not evident before weeks 13 and 17, resp. Although induced by a carcinogen, the keratinization process in the tracheal epithelium corresponded to the pattern described for the postnatal development of soft keratin in the skin of normal rats. The hyperplastic epithelium of one animal sacrified at 18 weeks contained cystic structures, increased smooth endoplasmic reticulum, and an increased amount of cytoplasmic filaments. By 20 weeks one animal had developed tracheal papillomata. Such alterations may be precursors of papillary polyps.

5465 PREFERENTIAL *IN VIVO* LOCALIZATION OF ^{125}I-LABELED ANTIBODY IN A CARCINOGEN-INDUCED SYNGENEIC RAT TUMOR.

(E.) Bale, W. F. (Univ. Rochester Sch. Med. Dent., N.Y.), M. A. Contreras, M. J. Izzo, D. Della Penta and D. J. Buchsbaum. *Prog Exp Tumor Res* 19:270-283, 1974.

Localization of ^{125}I-labeled antibody was investigated in a fibrosarcoma induced by methylcholanthrene in a Fischer-344 (F-344) rat and carried by transplantation in syngeneic rats. The source of antibody was antiserum obtained from Buffalo rats following repeated inoculation with the tumor. The first of the three antibody preparations tested was absorbed only with F-344 erythrocytes (type I antibody); the second (type II) corresponded to the γ-globulin fraction obtained by passing a portion of type I through a Sephadex G-200 column; and the third (type III) was type I antibody absorbed *in vivo* by normal F-344 rats. In each instance, the injected dose also contained ^{131}I-labeled normal Buffalo rat γ-globulin. For rats receiving type II and type III antibody, ratios of ^{125}I and ^{131}I abundance in tumors less than 2.6 g were 1.34 and 1.50, resp. These ratios are greater than one and thus give evidence of preferred localization of antibody in tumor. This ratio for type I antibody did not differ significantly from one. The ^{125}I retention averaged 30% of the injected dose for type I antibody, 44% for type II, and 50% for type III. Retention of ^{131}I averaged 70% for all rats. In rats receiving type I antibody, the ^{125}I concentration in tumor (measured in terms of total ^{125}I content) averaged 5.8% of the body burden in an amount of tumor equal to 1% of the rat weight. The same value for ^{131}I was 2.4%. This difference and a much higher tumor-blood ratio for ^{125}I indicated that selective localization of ^{125}I also occurred in these tumors. Preferential ^{125}I localization was not observed in large tumors. ^{125}I abundance was generally low in normal organs and tissues, but highly preferential localization of ^{125}I occurred in the spleen after injection of all three antibody types. With type I antibody, ^{125}I-labeled material bound rather strongly to tumor lipoproteins *in vitro*, less strongly to F-344 spleen lipoproteins, and in smaller amounts to Buffalo spleen lipoproteins. Binding to tumor lipoproteins was reduced with type III antibody. Localization of ^{125}I-labeled Buffalo rat antibody to a major F-344 histocompatability antigen was measured in F-344 skin grafted onto normal Buffalo rats. Localization reached 50% of the injected ^{125}I dose in an amount of tissue equal to 1% of the rat weight. The alloantibody decreased rapidly after antibody injection, with the 48-hr value being 25% of the 24-hr value. It is postulated that this rapid removal of alloantibody may result from interiorization of tumor-specific antibody into the cells. If confirmed, this might provide a method for introducing a chemotherapeutic drug directly into tumor cells.

5466 ESTROGEN-INDUCED HYPERNEPHROMA.

(E.) Belle R. E. (U.S. Watson Army Hosp., Fort Dix, N. and A. P. Squitieri. *J Urol* 112(2):160-161, 1974.

Hypernephroma induced by estrogen therapy is reported in a 55-yr-old man. He had undergone transurethral resection of the prostate for Stage C adenocarcinoma seven yr previously, followed by bilateral orchiectomy and 0.5 mg/day of diethylstilbestrol. The patient presented with gross, total, painless hematuria which cleared spontaneously. Physical examination revealed only a hard nodule on the left side of the prostate and extending along the left seminal vesicle. An excretory urogram revealed a neovascular mass in the lower pole of the left kidney which was confirmed by aortography; cytoscopy was unremarkable. Complete blood count and bone marrow examinations showed sideroblastic anemia. The preoperative alkaline phosphatase value was slightly elevated at 17 and 21 King-Armstrong U. Left thoraco-abdominal radical nephrectomy was performed. The renal vein was not grossly involved. The tumor invaded the renal capsule and entered but did not penetrate the perinephric fat. Histologic examination showed renal cell carcinoma. This is the first reported case of renal adenocarcinoma in a man receiving estrogen therapy. It had been previously demonstrated that 30% of all hypernephromas in men are sex-hormone dependent and it is concluded that patients receiving prolonged estrogen therapy for carcionoma of the prostate are at an increased risk to develop a hypernephroma.

5467 SPECIFIC BINDING OF OESTRADIOL BY OESTROGEN INDUCED PROLACTIN SECRETING PITUITARY TUMOURS IN RATS.

(E.) Attramadal, A. (Inst. Pathol., Univ. Oslo, Norway), E. Haug, O. Naess and K. Skullerud. *Acta Pathol Microbiol Scand[A]* (Suppl 248): 21-31, 1974.

Pituitary tumors were induced in Fisher and Sprague-Dawley rats by s.c. implantation of two pellets containing 5 mg diethylstilbestrol (DES) and 15 mg of cholesterol each. The plasma levels of prolactin were examined by radioimmunoassay and the binding of estradiol was determined by *in vitro* incubation with ^{3}H-estradiol. The pituitary tumors were of nearly the same size in both species of rats, with a mean weight of 244 mg in Fisher and 235 mg in Sprague-Dawley rats. The mammary glands were enlarged and grossly secretory in most of the animals. By light microscopy the ducts and alveoli were heavily distended with milk. The centration of plasma prolactin was extremely high both species of rats with pituitary tumors, with en values of 25413 ng/ml for Fisher and 12086 ng/ml d Sprague-Dawley rats. The cytosol of the pituitary uor tissue and the cytosol fractions of the preoptic ra and the anterior and posterior parts of the hypo-hlamus of the tumor-bearing animals possessed speci-i estrogen binding components all with a sedimenta-in coefficient of approximately 8 S. The sedimenta-in coefficient of the estrogen binding component of h pituitary tumor tissue was similar to that of the cmal pituitary gland. The cytosol of the pituitary uor tissue exhibited a binding of radioactivity ht was 1/3 to 1/4 of that bound by the cytosol of h normal pituitary/mg protein. The 8 S binding cponent was not present in the serum or in the cyto-d of striated muscle tissue. The dissociation tdies showed that unlabeled estradiol did not sign-fcantly displace radioactivity already bound by the component. The binding was completely eliminated hn unlabeled estradiol was added to the cytosol rctions before the incubation with ^{3}H-estradiol. etosterone, progesterone and cortisol were without fect. Protease and heat completely eliminated the iding of radioactivity. Treatment with RNA resulted ra more rapid sedimentation of the estrogen binder. srogen-induced pituitary tumors appear to provide rappropriate model in the study of hormone regulation.

48 MOLECULAR MECHANISMS OF STEROID-MEDIATED ALTERATIONS IN TARGET CELL GROWTH AND IFERENTIATION: INDUCTION OF SPECIFIC MESSENGER NS. *(E.)* O'Malley, B. W. (Baylor Coll. Med. eas Med. Cent., Houston), L. Chan, S. E. Harris, .P. Comstock, J. M. Rosen and A. R. Means. *Cold ing Harbor Conf Cell Proliferation* 1:85-96, 94.

e effects of diethylstilbestrol (DES) on oval-uin mRNA activity and tissue ovalbumin concen-rtions were studied in seven-day-old female tde Island Red chicks treated with DES (5 mg/day .) for 12 days. Tissue ovalbumin levels were eermined immunochemically; mRNA was partially uified on Millipore filters and assayed for its tlity to promote ovalbumin synthesis in a hetero-cous protein synthesis system. Ovalbumin was ist detected in oviduct cells at 24-48 hr of srogen stimulation, and intracellular concentra-ins increased progressively over the next 12 es. Measurements on the same tissue samples twed a striking correlation between oviduct vlbumin accumulation and its mRNA activity over r0- to 17-day period. Two weeks after DES with-rwal, the basal rate of ovalbumin synthesis was ey low. However, a single 1 mg injection of I in estrogen-pretreated chicks produced a defi-ie increase in the rate of ovalbumin synthesis ihin three hr, coincident with the appearance fovalbumin mRNA activity. The rate of protein thesis peaked at 18-20 hr and returned to eeline by 36 hr. Messenger RNA activity peaked t18 hr and declined to undetectable levels by hr. These data indicate that the intracellular cumulation of mRNA for ovalbumin is the rate-iiting factor in the estrogen induction of is protein in the chick oviduct. Furthermore, experiments using a ^{3}H-DNA probe complementary to ovalbumin mRNA indicated that estrogen acts to cause repeated transcription of a (single) gene to produce the large intracellular concentration of ovalbumin (65% of total protein) found in oviduct cells. Administration of progesterone (1 mg s.c.) to estrogen-pretreated chicks resulted in the appearance of avidin mRNA at six hr and accumulation of avidin in oviduct tissue at 6-12 hr. Avidin mRNA levels increased sharply prior to the peak rate of avidin synthesis. It is suggested that steroid hormones act at least in part to increase the rate of synthesis of specific mRNAs. The overall results are consistent with the hypothesis that generation of mRNA is a rate-limiting factor in the steroid hormone-mediated induction of differentiation-specific proteins.

5469 CERVICAL ADENOCARCINOMA IN A WOMAN ON LONG-TERM CONTRACEPTIVES. *(E.)* Czernobilsky, B. (Kaplan Hosp., Rehovot, Israel), I. Kessler and M. Lancet. *Obstet Gynecol* 43(4):517-521, 1974.

A case report is presented for a 35-yr-old woman diagnosed with a papillary endocervical adenocarcinoma. The patient (a gravida three, para three Jewish woman) was admitted with a two-month history of irregular vaginal bleeding; for four yr previous to admission, she had been taking Metrulen M (mestranol, 100 μg and ethynodiol diacetate, 1 mg). During examination, the cervix bled on touch, and the birth control regimen was discontinued. The patient was examined three weeks later, when physical findings were similar, and an endometrial curettage and cervical electro-coagulation were carried out. Microscopic examination of the material revealed a papillary lesion, and subsequent fractional curettage placed its origin in the endocervix. Morphologically, the carcinoma did not resemble the benign hyperplastic lesions usually found in contraceptive users, but constituted a typical papillary adenocarcinoma as previously described in patients who have not been on hormonal medication. Therapy consisted of 4000 rads ^{67}Co to the lower abdomen, and intravaginal (20 mg, 142 hr) and intrauterine (40 mg, 96 hr) radium; hysterectomy was performed nine months later. The patient was well with no evidence of recurrence three yr after surgery; vaginal cytology smears have remained negative. Although such cases of endocervical adenocarcinoma are rare (this is the fourth reported case) in women on birth control regimens, vigilance is recommended.

5470 RECURRENT MASSES AT SITES OF PRIOR KREBIOZEN, (NSC-8752) INJECTIONS. *(E.)* Stolinsky, D. C. (Oncol. Serv., Univ. South. California, Los Angeles) and J. R. Bateman. *Cancer Chemother Rep* 58(2):249-251, 1974.

A case is described of a 28-yr-old man originally diagnosed with embryonal rhabdomyosarcoma in the right calf. The mass was excised, and three months later three rib metastases were treated with radiotherapy; hilar and superior mediastinal masses responded to further radiotherapy. The patient was admitted one month later with multiple subcutaneous masses, generalized adenopathy and hepatosplenomegaly.

After a short subsidence during treatment with cyclophosphamide, these increased in size once more and a marked superior vena cava syndrome appeared. Vinblastine in combination with vincristine was given for three days; all masses decreased in size and the superior vena cava syndrome subsided. Therapy was continued in three-day courses for five months and the disease remained in complete remission for 63 months. During a follow-up visit five yr after the end of therapy, a tender mass (12 x 7 cm) in the left quadriceps muscle, two 1-cm lymph nodes in the left inguinal area, and a smaller mass in the right quadriceps muscle, were palpated. These disappeared and were attributed to a respiratory tract infection. Results of serum protein tests were negative at this time. The patient revealed that before the start of chemotherapy he had received daily injections of Krebiozen (creatine monohydrate) for one week, into the anterior muscles of both thighs. The patient presented with upper gastrointestinal bleeding 63 months after cessation of therapy. Barium studies revealed a gastric mass; a large mass involving the stomach, small intestine and retroperitoneum was found at laparotomy and was diagnosed by biopsy as an anaplastic malignant neoplasm. Further chemotherapy was not successful, and autopsy showed a large mass involving the stomach, lungs, liver duodenum, common bile duct, and retroperitoneal and mediastinal lymph nodes with the histologic appearance of gastric carcinoma. Cystic oil granuloma-like areas were noted in the quadriceps muscles. Previous reports of (mineral-oil containing) Krebiozen-induced recurrent masses at the injection sites, with temporal relation to respiratory tract infection, are not recorded in the literature.

5471 THERMAL SENSITIZATION OF CHINESE HAMSTER CELLS TO METHYL METHANESULFONATE: RELATION OF DNA DAMAGE AND REPAIR TO SURVIVAL RESPONSE.

(E.) Ben-Hur, E. (Biol. Dep., Brookhaven Natl. Lab., Upton, N. Y.) and M. M. Elkind. *Cancer Biochem Biophys* 1(1):23-32, 1974.

The combined effects of hyperthermia and treatment with methyl methanesulfonate (MMS) on DNA damage and repair and on the survival response of Chinese hamster cells were studied *in vitro*. Treatment of the cells with MMS at temperatures above 37 C increased the rate of cell killing. Furthermore, thermal sensitization was markedly enhanced by lengthening the exposure times at elevated temperatures. Temperatures up to 41 C led to a reduction in the shoulder of the survival curve, while those above 41 C resulted in an additional increase in the final slope of the survival curve. Fractionated exposures to MMS revealed that during incubation at 37 C between two exposures, the cells were able to repair sublethal damage, while incubation at 41 C reduced the extent of such repair. DNA from MMS-treated cells was sedimented in alkaline sucrose gradients to demonstrate drug-induced lesions expressed as single-strand breaks under alkaline conditions. A pronounced increase in the yield of single-strand breaks was observed after drug treatment at 42 C compared with 37 C. The repair of single-strand breaks in the DNA derived from MMS-treated cells was also inhibited by incubation at 42 C. Prolonged incubation of MMS-treated cells at 42 C finally led to degradation of the DNA derived from them. This data supports previous data in suggesting a partial similarity in action between MMS and X-irradiation.

5472 THE USE OF DIFFERENT TEST SYSTEMS WITH YEASTS FOR THE EVALUATION OF CHEMICALLY INDUCED GENE CONVERSIONS AND GENE MUTATIONS.

(E.) Loprieno, N. (Lab. Mutagenesi Differ. C.N.R., Univ. Pisa, Italy), R. Barale, C. Bauer, S. Baroncelli, G. Bronzetti, A. Cammellini, A. Cinci, G. Corsi, C. Leporini, R. Nieri, M. Nozzolini and C. Serra. *Mutat Res* 25(2):197-217, 1974.

Methodologies are described for analyzing the genetic effects induced by a well-known chemical mutagen, ethyl methanesulfonate (EMS). Haploid *Schizosaccharomyces pombe* and diploid *Saccharomyces cerevisiae* yeast cells were treated *in vitro* with EMS in buffer or in the presence of mouse liver microsomes. They were also exposed to EMS *in vivo* in the mouse peritoneum (host-mediated assay). With these different methods of assaying the genetic activity of a compound, its metabolic activation in the mammalian body was taken into account which might lead to a more reliable extrapolation of data from laboratory experiments to man. The relationships between dose and frequency of induced genetic effects were described by equations obtained from regression analyses of the data, allowing quantitative comparisons among the different methodologies and different genetic systems. One genetic system analyzed was represented by forward-mutations scored phenotypically on a nonselective medium. Mutations induced in five loci with different sensitivity and range data of mutation-induction per locus were derived. The second genetic system was provided by scoring on a selective medium mitotic gene-conversions induced in two loci with different kinetics. The results indicated that the host-mediated assay had a very low sensitivity, this assay being completely inefficient in demonstrating the gene conversion activity of EMS. When the two gene conversion systems with *S. cerevisiae* were used, a metabolic activation of the EMS produced by the liver microsomal enzymes was evident. The kinetics of conversion-induced frequency in the presence of microsomal enzymes was the same as that observed in buffer, suggesting that microsomal enzymes increase the spontaneous alkylation reaction.

5473 TOXIC EFFECT OF DIMETHYLNITROSAMINE IN COWS.

(E.) Koppang, N. (Vet. Coll., Norway, Oslo). *J Natl Cancer Inst* 52(2):523-528, 1974.

The effects of dimethylnitrosamine (DMNA), and of herring meal which had spontaneously formed DMNA, were investigated in two studies on cows. Norwegian milking cows were divided into three groups: the first two each comprised one milk cow and four calves the third, two milk cows and three calves. In the first experiment, herring meal containing toxic levels of DMNA (74-122 ppm) was fed to the animals in the following doses: 1) 0.4 mg DMNA/kg/day, 2) 0.2 mg/kg/day and 3) 0.1 mg/kg/day. In the second experiment, pure DMNA was administered in a 1% H_2O solution to the milk starter, in the same dosages in the first experiment. Liver function tests OT, SGPT, and serum-LDH) were performed every ond week, polarographic analyses were made of milk ples from the cows and liver biopsy specimens were ained at the onset of symptoms and after recovery. sues taken at autopsy from all but three animals e fixed, paraffin-embedded and stained. There was difference in the progress, symptoms and pathologic ions in cattle receiving either the toxic herring l or pure commercial DMNA. Significant disease caused by herring meal at 23 mg DMNA/kg, which related closely with that found for pure DMNA mg/kg). If the daily DMNA intake was about 0.1 kg, no clinical toxic effect was evident, even if total dose exceeded 40-58 mg/kg. Liver biopsy and ropsy showed minimal occlusive changes in hepatic ns. However, if the daily intake was greater than mg/kg, a total of 12-26 mg/kg caused serious nical disease and the deaths of several animals. histologic sequence in the hepatic damage seems be conditioned by the veno-occulsive disease. No ors were found in cattle, and three are still being lowed. DMNA intoxication may be a useful model for study of this form of progressive hepatic fibrosis. development of the disease can be followed by uential necropsy as well as liver biopsy. It is cluded that further studies are necessary to ermine whether, given that a threshold effect of drug was demonstrated, the intake of a few μg rosamine in the diet might be permissible.

4 *IN VITRO* CULTURE OF CELLS ISOLATED FROM DIMETHYLNITROSAMINE-INDUCED RENAL MESEN-
MAL TUMORS OF THE RAT.

(E.) Hard, G. C. (Baker
. Res. Inst., Prahran, Australia) and R. Borland.
ology 30(6):485-492, 1974.

ls isolated from dimethylnitrosamine-induced renal enchymal tumors in Wistar rats were cultured *in ro* to compare their behavioral properties with the *vitro* behavior of kidney cortex cells from normal s. Tumors were induced in rats of the outbred ton albino Wistar stock or inbred Wistar albino ko strain by means of a single 60 mg/kg i.p. dose dimethylnitrosamine. Cells isolated from the tumors established in long term culture retained various perties of malignant cells. In contrast to cells tured from normal rat kidney cortex, tumor cells eared to have an unlimited growth potential, were e to establish clones at low seeding rates and to duce colonies in carboxymethyl cellulose gel and chick embryo chorioallantoic membrane, and were lutinable by concanavalin A. Cells of tumor lines e quantitatively smaller than normal cells, had a her nucleus: cytoplasm ratio, a broader range of tiple nucleoli and a higher mitotic index. The a demonstrate that cells isolated from renal mes- hymal tumors induced by dimethylnitrosamine behave a markedly different fashion in serial culture than ir normal counterparts and retain the properties malignant cells.

5 EXPERIMENTAL STUDIES ON POLYPOGENESIS AND CARCINOGENESIS OF THE LARGE INTESTINE.

Kikkawa, N. (Osaka Univ. Med. Sch., Japan).
J Osaka Univ 24(4):293-314, 1974.

The growth patterns of polyps and cancers and the disarrangements of synthesizing DNA in the rat large intestine were studied by tritiated thymidine microautogradiography following the direct application of 0.5 ml of 0.25% N-methyl-N'-nitro-N-nitrosoguanidine (MNNG) to the distal colon of male Sprague-Dawley rats. The rectal administration of MNNG produced polyps and cancers at an incidence rate of 89.7% within about 30 weeks. Many microscopic lesions were discovered within the normal-appearing mucosa before the macroscopic tumors became grossly visible. These lesions appeared as proliferative foci confined within a few colonic crypts and were surrounded by normal epithelium. These first microscopic lesions were generically termed 'atypical epithelium foci' and were classified into six grades according to the degree of epithelial atypism: normal epithelium, hyperplastic epithelium focus, adenomatous epithelium focus with mild atypia, adenomatous epithelium focus with severe atypia, *de novo* carcinoma *in situ* (microscopic cancer focus), and *de novo* carcinoma with invasion (microscopic cancer focus). The hyperplastic polyps arose from these hyperplastic epithelium foci, while the adenomatous polyps arose from adenomatous epithelium foci. The initial changes in polypogenesis occurred at the proliferative epithelium in the lower portion of the crypts. In the hyperplastic lesions, there was an upward widening of the proliferative zone, while in the adenomatous lesions, there was both an upward widening of the proliferative zone and an acceleration in DNA synthesis in this zone. This experimental model provides a means for tracing the histogenesis of large intestinal polyps and cancers.

5476 INDUCTION OF VARIANTS BY NITROSOGUANIDINE IN DIPLOID AND TETRAPLOID LINES OF CHINESE HAMSTER CELLS.

(E.) Harris, M. (Dep. Zool., Univ. California, Berkeley). *Biochem Dis* 4(Part B): 575-590, 1974.

Nitrosoguanidine (MNNG) was used to increase the spontaneous frequency of variations in diploid and tetraploid lines of Chinese hamster cells. Cultures were exposed to graded concentrations (1×10^{-5} to 1×10^{-7}) of MNNG and assayed for changes in heat sensitivity and for resistance to 8-azaguanine. An absolute increase in variant frequency was observed for both markers, and the dose-response curves were approximately exponential with mutagen concentration when adjusted for relative plating efficiency. No significant differences between diploid and tetraploid cells were noted when the slopes of induced variations were compared for either of the two markers studied. Thus, a ploidy effect on induced variation seems to be lacking, in agreement with earlier studies which showed that spontaneous mutation rates for these markers are independent of ploidy level. These findings are not readily explained on the basis of conventional gene or chromosome changes. Two models for nonchromosomal patterns of inheritance are outlined. The first assumes that stable shifts in phenotypic expression take place within clonal populations of somatic cells in culture, e.g., that *de novo* variations are epigenetic rather than genetic. The second model assumes that the same changes might be based on alterations in genetic information but at a cytoplasmic rather than a nuclear locus.

5477 PHORBOL MYRISTATE ACETATE: EFFECTS OF A TUMOR PROMOTER ON INTRACELLULAR CYCLIC GMP IN MOUSE FIBROBLASTS AND AS A MITOGEN ON HUMAN LYMPHOCYTES. *(E.)* Estensen, R. D. (Univ. Minnesota Med. Sch., Minneapolis), J. W. Hadden, E. M. Hadden, F. Touraine, J. L. Touraine, M. K. Haddox and N. D. Goldberg. *Cold Spring Harbor Conf Cell Proliferation* 1:627-634, 1974.

The effects of phorbol myristate acetate (PMA) on intracellular cyclic GMP production were studied in mouse fibroblasts and human lymphocytes. Confluent monolayer cultures were exposed to PMA for periods of 15 sec to 48 hr, and the effects on cell density and and cyclic GMP levels measured. The effects of PMA on human blood lymphocyte "transformation," (^3H)thymidine uptake, and 2-deoxyglucose uptake were also studied. PMA caused a rapid and striking increase in intracellular cyclic GMP in Balb/c 3T3 cells, and also produced a 2-fold increase in cell number. The increase in cyclic GMP was maximal within the first min, decreasing to control levels within 3 min. PMA had similar effects on human blood platelets, and in human lymphocytes it produced morphologic transformation, increased the incorporation of (^3H)thymidine into acid-insoluble material and increased the rate of 2-deoxyglucose uptake. In the lymphocytes which responded to the mitogenic action of PMA, about 95% of the response was eliminated by exposure to bromodeoxyuridine. Although PMA produced similar effects to those produced by phytohemagglutinin (PHA), experiments in which cultures were exposed to both mitogens indicated that PHA and PMA act on different subpopulations of lymphocytes. The effects of PMA appear to be associated with its ability to increase intracellular cyclic GMP levels and is useful as an indicator or probe for those cell functions which may be modified by changing cyclic GMP concentrations.

5478 SUBCUTANEOUS SARCOMAS IN RATS FOLLOWING IMPLANTATION OF VITALLIUM IN DIFFERENT FORMS. *(E.)* Maltoni, C. (Inst. Oncol. "F. Addarii" and Tumor Center, Bologna, Italy), L. Gualano and G. Lefemine. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:23-24, 1974.

The oncogenic effect of Vitallium, an alloy of chromium, cobalt, and molybdenum, was studied following s.c. implantation in 16-week-old Sprague-Dawley rats. The implants consisted of discs 0.4 mm thick and 2 cm in diameter, similar discs with nine equidistant holes (1 mm in diameter spaced 5 mm from each other), and small cylindrical fragments 2 mm long and 1 mm thick. Transplantable fibrosarcomas and rhabdomyosarcomas were produced in 40% of the mice receiving the disc implants, 53% of the females and 40% of the males receiving the disc implants with holes, and 13% of the females and none of the males receiving the fragment implants. The mean latency period varied from 67 weeks in the males receiving the fragment implants. The results suggest that the implantation of Vitallium should be considered as potentially oncogenic for man.

5479 RADIOLOGICAL DETECTION AND SEQUENTIAL OBSERVATION OF EXPERIMENTALLY INDUCED BLADDER TUMOURS IN THE EUROPEAN HAMSTER. *(E.)* Eckel, H. (Hannover Med. Sch., West Germany), G. Reznik, H. Reznik-Schuller, B. Ohse and U. Mohr. *Br J Cancer* 30 (6):496-502, 1974.

5480 PRELEUKAEMIC ABNORMAL MYELOPOIESIS INDUCED BY CHLORAMBUCIL: A CASE STUDY. *(E.)* Tulliez, M. (Henri Mondor Hosp., Creteil, France), M. F. Ricard, F. Jan and C. Sultan. *Scand J Haematol* 13(3):179-183, 1974.

5481 MESOTHELIOMAS IN RATS FOLLOWING THE INTRAPERITONEAL INJECTION OF CROCIDOLITE. *(E.)* Maltoni, C. (Inst. Oncol. "F. Addarii" and Tumor Center, Bologna, Italy) and C. Annoscia. *Proc Fifth Int. Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:115-116, 1974.

5482 SUBCUTANEOUS SARCOMAS IN RATS FOLLOWING LOCAL INJECTION OF CHROMIUM ORANGE AND MOLYBDENUM ORANGE. *(E.)* Maltoni, C. (Inst. Oncol. "F. Addarii" and Tumor Center, Bologna, Italy), C. Sinibaldi and P. Chieco. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:133-134, 1974.

5483 DITERPRENE ESTERS FROM "EUPHORBIUM" AND THEIR IRRITANT AND COCARCINOGENIC ACTIVITY. *(E.)* Hergenhahn, M. (Inst. Biochem., Heidelberg, West Germany), S. Kusumoto and E. Hecker. *Experientia* 30(12): 1438-1440, 1974.

5484 CHANGES IN THE HEPATOTOXICITY BY DIMETHYLNITROSAMINE IN RELATION TO MODIFICATIONS OF THE DRUG METABOLIZING ENZYME SYSTEM. *(E.)* Gravela, E. (Inst. Pathol. Gen., Univ. Turin, Italy), P. Pani and G. Bertone. *Ital J Biochem* 23(6):402-411, 1974.

5485 LOCALIZATION OF A CARCINOFETAL ANTIGEN ON CELL MEMBRANE OF CHEMICALLY INDUCED RAT INTESTINAL CARCINOMAS. *(E.)* Martin, F. (INSERM U-45, Fac. Med., Dijon, France), M. S. Martin, S. Knobel and M. Bordes. *Digestion* 11(5/6):451-452, 1974.

5486 GIANT CELL FORMATION AFTER INTRAPERITONEAL APPLICATION OF CROCIDOLITE ASBESTOS FIBRES IN RATS: COVER SLIP METHOD. *(E.)* Sethi, S. (Med. Inst. Air Hyg. Silocosis Res., Univ. Duesseldorf, West Germany), E. G. Beck and N. Manojlovic. *Ann Occup Hyg* 17(1):53-56, 1974.

5487 SPECTROPHOTOMETRIC INVESTIGATIONS OF AFLATOXIN B_1 BINDING TO RAT LIVER MICROSOMES. *(E.)* Norpoth, K. (Inst. Silicosis Res. Ind. Med., Muenster Univ., West Germany), H. Bosenberg, U. Witting, P. Kruse and S. Grass. *Hoppe Seylers Z Physiol Chem* 355(7):867-871, 1974.

188 LONG TERM EFFECT OF CIGARETTE SMOKE ON
MUCOCILIARY FUNCTION IN ANIMALS. *(E.)* Ira-
ani, J. (Silicosis Res. Inst. of Mining Assoc., Bochum,
st Germany) and G. N. Melville. *Respiration* 31(4):
8-366, 1974.

189 INDUCTION OF DNA SYNTHESIS BY ISPROTERENOL
IN THE RAT URINARY BLADDER EPITHELIUM. *(E.)*
inter, W. A. (Assoc. for Radiation and Environmental
es., Munich, West Germany). *Histochemistry* 41(2):141-
43, 1974.

190 RESERPINE USE IN RELATION TO BREAST CANCER.
(E.) Heinonen, O. P. (Boston Collab. Drug
urveill. Program, Mass.), S. Shapiro, L. Tuominen and
. I. Turunen. *Lancet* (7882):675-677, 1974.

491 EFFECT OF SELECTED CARCINOGENS ON FREE-LIVING
NEMATODES. PART I. EVOLUTION OF THE POPULA-
ATION, INTERSPECIES CONCURRENCE, pH CURVE, OSMOTIC
DADABILITY AND SEX RATIO. *(Ger.)* Meyer, S. (Special
nd Applied Zoology Dept., Ernst-Moritz-Arndt Univ.,
reifswald, East Germany) Kampfe, L. *Wiss Z Ernst-
oritz-Arndt-Univ* 22(1/2):41-48, 1973.

192 GROWTH INHIBITING ACTION OF TRENIMON ON A
NMU INDUCED SARCOMA. *(Ger.)* Fuhse, P.
Pathol. Inst., Acad. Med. Erfurt, East Germany), U.
icker and R. Tust. *Arch Geschwulstforsch* 44(2):130-
33, 1974.

93 THE TUMORIGENIC EFFECT OF CERTAIN NITROGEN-
CONTAINING COMPOUNDS ON THE PROGENY OF EX-
RIMENTAL MICE. *(Rus.)* Golub, N. I. (Inst. Exp.
in. Oncol., Moscow, USSR), T. S. Kolesnichenko and
M. Shabad. *Biull Eksp Biol Med* 78(12):62-65, 1974.

94 THE EFFECT OF POLYINOSINIC-POLYCYTIDYLIC
ACID ON THE TRANSCRIPTION OF THE SV40
NOME IN AFRICAN GREEN MONKEY KIDNEY CELLS. *(E.)*
andner, G. (Dep. Virol., Inst. Hyg., Univ. Frei-
rg, West Germany), N. Mueller, J. Burger, E. Koch
d A. Burger. *Acta Virol* 18(4):284-292, 1974.

95 AN IMPROVED METHOD FOR THE DETERMINATION
OF NITRATE AND NITRITE IN FRESH AND CANNED
UIT AND VEGETABLE PRODUCTS. *(E.)* Eipeson, W. E.
ent. Food Technol. Res. Inst., Mysore, India), M.
hadeviah, R. V. Gowramma and L. V. L. Sastry. *J
od Sci Technol* 11(5):209-212, 1974.

96 THE INFLUENCE OF CHRONIC CADMIUM ON THE
CYCLIC AMP-ADENYL CYCLASE-PROTEIN KINASE
STEM OF RAT TESTES AND PROSTATE GLANDS. *(E.)*
ang, B. K. (Pharm. Dep., Univ. Ottawa, Canada),
J. B. Sutherland, Z. Merali and R. L. Singhal.
d Proc 33(3):227, 1974.

5497 FECAL STEROIDS AND COLON CANCER. *(E.)* Core, S. K. (West Virginia Univ., Morgantown) and A. L. Watne. *Fed Proc* 33(3):260, 1974.

5498 MYCOTOXINS: TOXICITY, CARCINOGENICITY, AND THE INFLUENCE OF VARIOUS NUTRITIONAL CONDITIONS. *(E.)* Newberne, P. M. (Dept. Nutr. Food Serv. Sci., Massachusetts Inst. Technol., Cambridge, Mass.). *Environ Health Perspect* 9:1-32, 1974.

5499 ASBESTOS IN THE WORKPLACE AND THE COMMUNITY. *(E.)* Smither, W. J. (Asbestos Res. Comm., England). *Environ Health Perspect* 9:327-329, 1974.

5500 INORGANIC PARTICLES IN HUMAN TISSUES AND THEIR ASSOCIATION WITH NEOPLASTIC DISEASE. *(E.)* Langer, A. M. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Environ Health Perspect* 9:229-233, 1974.

5501 INTERACTION OF ASBESTOS WITH ALVEOLAR CELLS. *(E.)* Suzuki, Y. (Fujita-Gakuen Univ., Sch. Med., Toyoka, Japan). *Environ Health Perspect* 9:241-252, 1974.

5502 PENETRATION OF CELLS BY ASBESTOS FIBERS. *(E.)* Davis, J. M. G. (Inst. Occup. Med., Edinburgh, Scotland), R. E. Bolton and J. Garrett. *Environ Health Perspect* 9:255-260, 1974.

5503 SMALL ANIMALS IN THE STUDY OF PATHOLOGICAL EFFECTS OF ASBESTOS. *(E.)* Holt, P. F. (Univ. Reading, Reading, England). *Environ Health Perspect* 9:205-211, 1974.

5504 EFFECTS OF INGESTED CHRYSOTILE ON DNA SYNTHESIS IN THE GASTROINTESTINAL TRACT AND LIVER OF THE RAT. *(E.)* Amacher, D. E. (Case West. Reserve Univ., Sch. Med., Cleveland, Ohio), A. Alarif and S. S. Epstein. *Environ Health Perspect* 9:319-324, 1974.

5505 THE SUBJECT OF CONTINUOUS VIGILANCE. *(E.)* Langer, A. M. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Environ Health Perspect* 9:53-56, 1974.

5506 IMMUNOLOGICAL REFLECTIONS ON ASBESTOS. *(E.)* Burrell, R. (Dep. Microbiol., West Virginia Univ., Morgantown, West Va.). *Environ Health Perspect* 9:297-298, 1974.

5507 PENETRATION OF ASBESTOS THROUGH THE DIGESTIVE WALL IN RATS. *(E.)* Pontefract, R. D. (Food Res. Lab., Canadian Dep. Natl. Health Welfare, Ottawa, Canada). *Environ Health Perspect* 9:213-214, 1974.

5508 INORGANIC PARTICLES OF AGRICULTURAL ORIGIN. *(E.)* Kay, K. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Environ Health Perspect* 9:193-195, 1974.

5509 VINYL CHLORIDE: POTENTIAL HAZARDS AND THE SITUATION IN THE NETHERLANDS. *(Dut.)* Balemans, A. W. M. (No affiliation). *Chem Weekbl* 70(43): 5, 1974.

5510 THE EFFECT OF SEX STEROIDS ON EXPERIMENTAL DYSPLASIA OF THE CERVICAL EPITHELIUM AND CERVICAL CANCER. *(Rus.)* Kaminetskii, G. (New Jersey Coll. Med. Dent., Newark). *Akush Ginekol (Mosk)* (2):45-48, 1974.

5511 STUDY OF THE CARCINOGENIC ACTIVITY OF LD- AND D-NORGESTREL ON MOUSE MAMMARY GLAND. *(Fr.)* Rudali, G. (Radium Inst., Paris, France) and M. Guggiari. *C R Soc Biol (Paris)* 168(10/12);1190-1194, 1974.

5512 THE CARCINOGENIC ACTION OF METHYL- AND ETHYLNITROSOUREA IN RATS AFTER TRANSPLACENTAL AND POSTNATAL ADMINISTRATION. *(Ger.)* Guthert, H. (Erfurt Med. Acad., E. Germany) and R. Warzok *Zentralbl Allg Pathol* 118(2/3):115-123, 1974.

5513 THE EFFECT OF TESTOSTERONE PROPIONATE ON EARLY POSTNATAL DEVELOPMENT OF RAT KIDNEY AND CELL DIFFERENTIATION THEREIN. *(Rus.)* Zufarov, K. A. (Tashkent Med. Inst., USSR), V. M. Gontmakher, B. A. Khidoiatov and Z. Z. Zagdulaiev. *Tsitologiia* 16(5):564-568, 1974.

5514 EVALUATION OF THE DNA CONTENT AND ITS DISTRIBUTION IN THE CELL NUCLEUS OF EXPERIMENTAL CANCER AND PRECANCER IN THE RAT LARGE INTESTINE. *(Ger.)* Herzog, R. E. (Surg. Hosp., Univ. Mainz, W. Germany) and R. Loth. *Res Exp Med (Berl)* 164(2): 151-156, 1974.

5515 BENZOPRENE CONTENT IN TOBACCO AND ITS URINARY EXCRETION. *(Fr.)* Repetto, M. (Natl. Inst. Toxicol., Seville, Spain) and D. Martinez. *Eur J Toxicol* 7(4):234-237, 1974.

See also:

* (Rev): 5401, 5402, 5403, 5404, 5405, 5424, 5429, 5430, 5431, 5439, 5440, 5444, 5446
* (Phys): 5519, 5527
* (Viral): 5571, 5589
* (Immun): 5629, 5633, 5644, 5652, 5698, 5718, 5729
* (Path): 5790
* (Epid-Biom): 5819, 5820, 5847, 5848, 5849, 5850, 5851, 5852, 5853

6 LEUKEMIC TRANSFORMATION OF DONOR SPLEEN CELLS FOLLOWING THEIR TRANSPLANTATION
O SUPERLETHALLY IRRADIATED MICE WITH PRE-EXISTING
AL LEUKEMIA.

(E.) Kuhnert, P. M. (Allegheny
. Hosp., Pittsburgh, Pa.), J. P. Okunewick and
Erhard. *Exp Hematol* 2(6):328-335, 1974.

recurrence of leukemia in donor type spleen cells
lowing a lethal dose of whole body x-irradiation
hematopoietic cell grafting was investigated
ng SJL/J mice. Recipient female mice were in-
ted i.p. at 12 weeks with 50 SED50 U of Rauscher
ine leukemia virus. At 14 weeks both control
leukemic mice were irradiated with 1100 R. Cells
m male mice were transplanted into Rauscher mur-
viral leukemic mice at 0, 1, and 2 days after
adiation. The induction of leukemia in the graft-
cells was verified by the occurrence of spleno-
aly and secondary spleen cell transplants;
secondary donors were transplanted mice still
ve at 30 days and the secondary recipients were
mal unirradiated mice. The spleen weights of
grafted leukemic mice were significantly great-
than those of the controls and all secondary re-
ients that received spleen cells from the primary
fted leukemic mice also died of leukemia. Ver-
cation that the regenerating hematopoietic tis-
was from donor (males) and not host source (fe-
es) was accomplished by spleen chromosome prep-
tions taken from randomly selected mice at 14
30 days after cell transplantation. In these
parations, the Y chromosome was clearly disting-
hable on the basis of size, shape and differential
ining. The data indicate that induction of leu-
ia after whole-body irradiation and hematopoietic
l transplantation can occur in immunologically
ched donor cells when a viral agent is present
that the incidence of this induction is not af-
ted by a time delay between irradiation and trans-
nt.

7 CARCINOGENIC EFFECT OF 100, 250 AND 500 RAD X-RAYS ON THE RAT THYROID GLAND.

(E.)
lach, I. (London Hosp., England). *Br J Cancer*
5):487-495, 1974.

role of thyrotrophin in low dose thyroid radiation
cinogenesis was investigated by giving hooded Lis-
rats 0, 100, 250 or 500 rad x-rays to the thyroid
id at 9-12 wk of age and then killing them 18-20 months
er. No thyroid tumors were found in the unirrad-
ed animals, a few follicular adenomata developed
er 100 and 250 rad and a follicular carcinoma after
rad. A similar group was set up and maintained on
et with thyroxine added in quantity to give a
ly consumption of 5-6 μg/100 g body weight in order
suppress thyrotrophin secretion. Thyroid tumor
ciency of the thyrotrophin suppression was tested
measurement of some rats of T/S ^{131}I concentration
ios and others of the 24 h% ^{131}I thyroid uptake.
some rats thyrotrophin was totally suppressed, in
ers partially suppressed. A further group was set
and maintained on the goitrogen 0.1% aminotriazole
the drinking water to cause excessive thyrotrophin
retion. All its subgroups, including unirradiated
nals, developed numerous follicular adenomata and
cinomata. Enhancement of carcinoma production was present in the 500 rad subgroup. It is concluded that the development of thyroid adenomas after the above doses of x-radiation may occur without an excessive rise in thyrotrophin secretion, that suppression of thyrotrophin lowers radiation tumor production, and that therefore, thyrotrophin may play a permissive role in the development of thyroid tumors following low dose x-radiation to the thyroid gland.

5518 EXCISION OF DAMAGED THYMINE RESIDUES FROM GAMMA-IRRADIATED POLY (dA - dT) BY CRUDE EXTRACTS OF *ESCHERICHIA COLI*.

(E.) Hariharan, P. V. (Dep. Biochem., Univ. Florida, Gainesville) and P. A. Cerutti. *Proc Natl Acad Sci USA* 71(9):3532-3536, 1974.

The selective removal of thymine products of the 5,6-dihydroxy-dihydrothymine type from γ-irradiated or osmium tetroxide-oxidized poly (dA-dT) by crude extracts of *Escherichia coli* is described. Poly (dA-dT) was irradiated under nonprotective conditions with 33 krads of ^{137}Cs γ-rays. The polymer used with extracts of *E. coli* endo I^- contained 0.36% γ-ray products of the 5,6-dihydroxy-dihydrothymine type, and the preparation used with extracts of *E. coli* endo I^- uvrA6^- contained 0.70% γ-ray products. The assay yield was 20% as determined by measuring the loss in absorbance at 267 nm in 0.2 M KOH, and the total content of ring-damaged thymine residues remaining attached to the polymer backbone was estimated at 1.8% and 3.5%, resp., in the two preparations. Within 20 min of incubation at 37 C, 60% of the γ-ray products of the 5,6-dihydroxy-dihydrothymine type was removed by the extracts of both *E. coli* strains. The kinetics of the product removal and the final level of γ-ray products remaining precipitable after 20 min of incubation were the same regardless of the presence or absence of the uvrA-gene product. Excision of γ-ray products of 5,6-dihydroxy-dihydrothymine type by the extracts of both strains remained incomplete. Nonirradiated poly (dA-dT) was degraded 4-5% by the extracts of both strains under the same conditions. Neither excision of γ-ray products of 5,6-dihydroxy-dihydrothymine type nor polymer degradation was observed when the extracts were heated to 70 C for ten min. The results demonstrate that the uvrA-gene product is not required for the excision of γ-ray products of the 5,6-dihydroxy-dihydrothymine type.

5519 THOROTRAST UPTAKE AND TRANSIT IN EMBRYONIC GLIA, HEART FIBROBLASTS AND NEURONS *IN VITRO*.

(E.) Wessells, N. K. (Dep. Biol. Sci., Stanford Univ., Calif.), M. A. Ludueña, P. C. Letourneau, J. T. Wrenn and B. S. Spooner. *Tissue Cell* 6(4):757-776, 1974.

The dynamics of thorotrast (colloidal thorium dioxide) uptake into chick embryo (eight days old) glia, heart fibroblasts, and neurons was studied *in vitro* under conditions favoring the normal membrane dynamics involved in cell locomotion and axon elongation and under conditions in which the intercellular contacts affecting such dynamics were rare or nonexistent. Thorotrast was incorporated into coated vesicles, various agranular vesicles and sacs and a surface-associated system of membranous channels within 1 min by single cultured glial and heart cells. The chemical appeared within 'C'-shaped bodies and in small, dense bodies of the lysosomal series within about 25 min, and with longer chase periods, it 'cleared' from all cytoplasmic organelles except those of the lysosomal series. This technique failed to distinguish a class of membranous organelles, located close to the cell periphery, which might serve as a source of new cell surface during locomotor activity. Thorotrast was also incorporated into almost all classes of membrane-bound organelles of the growth cones and axons of single nerve cells *in vitro* within as little as 1 min. This included elements of the smooth endoplasmic reticulum although no chemical entered the lysosomal granules during this short period. During various chase periods, the tracer disappeared from the initial sites of incorporation and accumulated in dense bodies of the lysosome series and within the growth cones and axons. 'C'-shaped bodies may have been an intermediate in this process. No unique sites of endocytotic activity or of a complete absence of endocytosis were observed which could be correlated with growth cone function or axonal elongation, although the presence of the tracer in agranular sacs of the smooth endoplasmic reticulum of the growth cones could reflect a hypothesized cycling of the cell surface.

5520 TUMOR-ASSOCIATED ALKYLDIACYLGLYCEROLS (ADAG) AND OTHER LIPIDS IN THE THYMUS DURING IRRADIATION-INDUCED LEUKEMOGENESIS. *(E.)* Brown, R. C. (Univ. North Carolina, Chapel Hill), J. A. Kostyu, M. L. Blank and A. Kilgore. *Fed Proc* 33(3): 601, 1974.

5521 CARCINOMA OF THE MAXILLARY SINUS FOLLOWING THOROTRAST INSTILLATION. *(E.)* Rankow, R. M. (Columbia Presbyterian Med. Ctr., New York, N.Y.), J. Conley and P. Fodor. *J Maxillofac Surg* 2(2/3): 119-126, 1974.

5522 EVIDENCE AGAINST A DIRECT CARCINOGENIC EFFECT OF X-RAYS *IN VITRO*. *(E.)* Klein, J. C. (Radiobiol. Inst. TNO, Rijswijk, Netherlands). *Radiat Res* 59(1):91, 1974.

5523 TRANSFORMATION *IN VITRO* BY X-RAYS AND NEUTRONS. *(E.)* Borek, C. (Columbia U., New York, N.Y.) and E. J. Hall. *Radiat Res* 59(1):91, 1974.

5524 STUDIES CONCERNING THE PROLIFERATION KINETICS IN THE KIDNEY OF RATS AFTER IRRADIATION AND/OR NEPHRECTOMY. 2. HISTO-AUTORADIOGRAPHIC AND HISTOLOGIC STUDIES. *(Ger.)* Emminger, A. (Med. Coll., Hannover, West Germany), H. Eckel and K. H. Kuhn. *Strahlentherapie* 148(4):397-403, 1974.

5525 THE RISK OF MALIGNANCY FROM INTERNALLY-DEPOSITED RADIOISOTOPES. *(E.)* Rowland, R. E. (Cent. Human Radiobiol., Argonne Natl. Lab., Ill.). *Radiat Res* 59(1):146, 1974.

5526 THE INTERPLAY OF VIRUSES AND RADIATION IN CARCINOGENESIS. *(E.)* Upton, A. C. (State Univ. New York, Stony Brook). *Radiat Res* 59(1):8, 1974.

5527 THE EFFECT OF TOBACCO SMOKE AND OTHER IRRITANT SUBSTANCES ON THE HUMAN TRACHEAL MUCOSA. *(Pol.)* Chodynicki, S. (Otorhinolaryng. Clin., Inst. Neurol. Dis. Sense Organs, Med. Acad., Bialystok, Poland). *Folia Med Bialostoc* 3:125-132, 1974.

5528 THOROTRAST INJURIES OF MESOPHARYNX. *(Ger.)* Brandt, R. H. (Clin. Otorhinolaryngol., Acad. Med., Magdeburg, E. Germany), P.-F. Lubcke and F. Theuring. *Radiol Diagn (Berl)* 15(1):3-8, 1974.

5529 THYROID CARCINOMA FOLLOWING TREATMENT WITH ^{131}I: ONE CASE. *(Fr.)* Hartemann, P. (Univ. Hosp. Cent., Brabois Hosp., Vandoeuvre-Nancy, France), J. Leclere, J. C. Valdenaire, D. Vaillant, G. Naegelen and J. Borelly. *Ann Endocrinol (Paris)* 35(3):277-278, 1974.

See also:

* (Rev): 5401, 5424, 5445, 5446, 5447
* (Immun): 5627
* (Path): 5790
* (Epid-Biom): 5847, 5848, 5849, 5850, 5851, 5852, 5853

;30 INHIBITION OF DNA POLYMERASES FROM RNA TUMOR VIRUSES BY TILORONE AND CONGENERS:
TE OF ACTION. *(E.)* Chandra, P. (Gustav-Embden
nt. Biol. Chem., Univ. Frankfurt/Main, Germany),
Will, D. Gericke and A. Gotz. *Biochem Pharmacol*
(23):3259-3265, 1974.

ıe mechanism by which the dihydro-chloride salt of
7-bis [2-(diethyl-amino) ethoxy]-fluoren-9-one
EAE-F) inhibits the DNA polymerase activity in RNA
ımor viruses was studied *in vitro* and *in vivo*.
mpared with controls infected with untreated vi-
ıs, mortality was significantly reduced and the
ırvival period significantly prolonged in mice
eated with MSV(M) which had been preincubated with
lorone or either of its two congeners, DEAP-P or
AA-fluorene. Viral suspensions treated with MEAA-
uorene were as active as untreated suspensions.
ior treatment of cell-free spleen extracts from
iend Leukemia virus (FLV)-infected mice with tilo-
ne or DEAP-fluoranthene, but not with DEAA-fluorene
MEAA-fluorene, resulted in a significant inhibi-
on of FLV-induced splenomegaly. The endogenous
tivity of FLV DNA polymerase was inhibited by a
riety of congeners of tilorone; a maximum inhibi-
on was obtained with DEAP-fluoranthene, with tilo-
ne, DMAA-dibenzothiophene, and DEAA-fluorene pro-
ıcing weaker inhibition and DMAA-dibenofuran pro-
ıcing a still weaker inhibition. MEAA-fluorene did
t inhibit the endogenous reaction at any concentra-
on. The FLV DNA polymerase reaction catalyzed by
ly(dA-dT) was more sensitive to tilorone and its
ngeners than the endogenous or poly rA$\cdot$(dT)$_{12}$-
talyzed reactions. The tilorone congeners which
ıhibited the DNA polymerases of FLV also suppressed
ıe oncogenic activity of the virus; a similar rela-
onship was observed in the MSV(M)-polymerase sys-
m. Product analysis of the DNA polymerase reaction
LV) in the absence and presence of tilorone showed
ıat the drug specifically blocks the formation of
ıe double-stranded DNA. Tilorone has a low affinity
r viral RNA, but can block the synthesis of ds-DNA
interacting with ss-DNA or hy-DNA.

;31 INHIBITION OF DNA POLYMERASES OF RNA TUMOR VIRUSES AND CELLS BY RIFAMYCIN SV DERIVA-
VES. *(E.)* Green, M. (St. Louis Univ. Sch. Med.,
.), C. Grugo, G. Gerard, D. Grandgenett and K.
ıimada. *Collect Pap Annu Symp Fundam Cancer Res*
:258-289, 1974.

provide evidence that the chemotherapy of viral
seases and cancer can be based on the selective
ıhibition of specific classes of polymerase mole-
ıles, RNA- and DNA-directed DNA polymerase activi-
es of RNA tumor viruses were used to screen for
lymerase inhibitors. The antibiotic rifamycin SV
d several of its semisynthetic derivatives speci-
cally bound to and blocked the activity of bacteri-
DNA-directed RNA polymerase, but did not inhibit
ammalian polymerases. Lengthening the 3-side chain
rifampicin, a rifamycin SV derivative, by substi-
ıting benzyl for methyl yielded compounds that in-
bited RNA-directed DNA polymerase of RNA tumor
ruses of murine, feline, and avian origin. The
esent findings demonstrated that further modifi-
ıtion of the 3-substituent of the ansa ring led
to stronger inhibitors. Of 182 3-carbon substituted and 4-substituted rifamycin SV derivatives, 17 were moderate and ten were strong inhibitors of the polymerase activities of the Moloney strain of murine sarcoma virus. Of the 27 active inhibitors, all except two were 3-substituted derivatives with large side chains. Derivatives with substituted cyclic amine side chains in position of the ansa ring were strong inhibitors of the RNA- and DNA-directed DNA polymerase activities of RNA tumor viruses of murine, feline, and avian origin. Derivatives that were effective against viral polymerase also blocked cell transformation by murine sarcoma virus. A DNA-directed DNA polymerase from human KB cells was less sensitive to inhibition by these derivatives than was the MSV polymerase. The drugs were found to function by binding to the polymerase molecule and by interfering with either the initiation of DNA synthesis or the binding of the template but not with chain elongation. The data suggest that further modification of the structure of rifamycin and rifamycin-like molecules may provide a promising approach to virus and cancer chemotherapy based on specific interactions with polymerase molecules.

5532 ABNORMAL REGULATION OF GRANULOPOIESIS IN HUMAN ACUTE GRANULOCYTIC LEUKEMIA. *(E.)*
Metcalf, D. (Cancer Res. Unit, Walter Eliza Inst., Melbourne, Australia) and S. H. Chan. *Bibl Haematol* (39):878-884, 1973.

Urine and serum levels of colony-stimulating factor (CSF) and serum inhibitor levels were measured in 35 patients with acute granulocytic leukemia or myelomonocytic leukemia. Serum CSF levels were above normal in 32% (106/336) of the samples. The 24 hr urinary output of CSF was above normal in 57% (948/1662) of the urines assayed. There was no close correlation between urine and serum CSF levels. Serum inhibitor levels were subnormal or completely absent in 53% of the patients tested. The differences in CSF and inhibitory levels were correlated with the progression of leukemia. The reported findings are interpreted as evidence of regulator disturbances in development and progression of the diseases, or of compensatory changes directed towards the restoration of normal hematopoiesis.

5533 MOLECULAR PROBING FOR A VIRAL ETIOLOGY OF HUMAN CANCER. *(E.)*
Spiegelman, S. (Inst. Cancer Res., New York, N.Y.), J. Schlom, R. Axel, R. Hehlmann and D. Kufe. *Collect Pap Annu Symp Fundam Cancer Res* 25:547-573, 1974.

A so-called simultaneous detection test for reverse transcriptase and high molecular weight RNA (60-70S) was used to obtain evidence for the presence of RNA tumor viruses in biological materials from human sources. Procedures were worked out with the aid of materials containing B- and C-type viruses of avian, rodent, feline, or primate origin. They involved isolation of the hypothetical virions by high-speed centrifugation, disruption of the virions by ND-40 detergent and 0.1 M dithiothreitol, carrying out of a standard reverse transcriptase reaction, gradient analysis of the product, and examination of the 70S region of the gradient for the presence of tritiated DNA, which results from complexing of small DNA pieces to relatively large RNA molecules. This provided evidence for the presence of a reverse transcriptase using a 70S RNA template. Finally, tests were made for possible homologies between RNAs isolated from different human cancers and RNAs from known tumor viruses of non-human species. An example of such a test was the annealing of tritiated DNA, prepared with the aid of mouse mammary tumor virus RNA and reverse transcriptase, with the hypothetical human tumor virus RNA, prepared from human malignant breast tumor. The results showed that human breast cancer contains RNA homologous only to that of the murine tumor virus, that human leukemias, sarcomas, and lymphomas all contain RNA homologous to that of the murine Rauscher leukemia virus and not to that of mouse mammary tumor virus RNA, and that none of the human tumors contain RNA detectably related to the RNA of the avian myeloblastosis virus. It was pointed out that the mere existence of mouse mammary tumor virus-related RNA in human breast cancer and of Rauscher leukemia virus-related RNA in human leukemia, sarcoma, and lymphoma does not establish a viral etiology for these diseases.

5534 CELL-FREE TRANSLATION OF HIGHLY PURIFIED ADENOVIRUS MESSENGER RNA. *(E.)* Eron, L. (Natl. Inst. Child Health Hum. Dev., Bethesda, Md.) and H. Westphal. *Proc Natl Acad Sci USA* 71(9):3385-3389, 1974.

Several polypeptides contained in the coat and the core of adenovirus type 2 particles were identified as virus gene products. These polypeptides were synthesized *in vitro* by a cell-free protein-making system programmed by adenovirus type 2 messenger RNA that had been hybridized with and eluted from virus DNA. Fractionation by size yielded subpopulations of viral messenger RNA that differed in their coding specificities although each of the two discrete size classes had the same genetic complexity as bulk RNA. This suggests that both size classes contain overlapping sequences of messenger RNA representing different stages of processing inside the infected cell. It is suggested that the procedures used in this study may be used to establish a genetic map of adenovirus type 2.

5535 MULTIENZYME SYSTEMS OF DNA REPLICATION. *(E.)* Schekman, R. (Stanford Univ. Sch. Med., Calif.), A. Weiner and A. Kornberg. *Science* 186(4168):987-993, 1974.

Escherichia coli H560 was used to prepare soluble extracts for the resolution of the DNA phage 0X174 enzymes. Chromatography resulted in seven protein fractions which were reassembled in the following order: 10 μl of dilution buffer, 0.13 μg of protein n, 0.73 μg of DNA-unwinding protein, a mixture of protein i (40 μg), dnaB protein (20 ng), dnaG protein (40 ng) and DNA polymerase III holenzyme (0.33 μg), and finally 2.5 μg of dnaC protein. After 40 min incubation at 30 C over 50% of the 0X174 viral template was replicated. The product was a nearly full-length synthetic strand having a gap between the 3' and 5' ends. DNA polymerase III holoenzyme was an absolute requirement in the reconstruction system. Spermidine (2 mM) and DNA-unwinding protein (4-7 μg/μg DNA template) were necessary for the initiation stage. Reconstitution of the seven purified fractions of DNA phage G4 was performed under the same conditions as for 0X174. Rifampicin-resistant DNA synthesis was achieved with dnaG protein, DNA-unwinding protein (or spermidine), and the DNA polyermerase III holoenzyme. Similar studies have provided evidence that the G4 DNA may only require dnaG protein for its initiation which would distinguish it from the more complex requirements of 0X174. Moreover, studies on DNA phage M13 have revealed a third multienzyme system with distinct initiation requirements. The diverse requirements which are necessary for the initiation of phage DNA replication reflect the complexity of this multienzyme system and that of chromosome replication in general.

5536 RESPONSE OF CHICK-EMBRYO KIDNEY CELLS *IN VITRO* TO TWO AVIAN TUMOR VIRUSES. *(E.)* Bonar, R. A. (VA Hosp., Durham, N.C.) and D. F. Paulson. *J Natl Cancer Inst* 53(3):711-718, 1974.

In vitro treatment of chick-embryo kidney cells with strain MC29 avian tumor virus resulted 90% of the time in changes in the cell populations to populations containing cells of one to four distinct morphological types with, generally, an enhanced growth rate. In most of the altered populations, the cells were epithelioid and grew in monolayers. Treatment of the cultures with BAI strain A (myeloblastosis) virus resulted in changes in only about 60% of the cultures tested, with the development of three morphologic cell types. The predominant cell type in these cultures was spindle shaped and grew in multiple layers when crowded. Little or no growth occurred in cultures not treated with virus. Cultures altered by either strain produced virions with morphology typical of avian tumor virus. Studies of these viruses *in vitro* should be relevant to the development of the kidney tumors *in vivo*, in that the viruses have similar effects *in vitro* and *in vivo*.

5537 ASSOCIATION OF THE VIRAL REVERSE TRANSCRIPTASE WITH AN ENZYME DEGRADING THE RNA MOIETY OF RNA-DNA HYBRIDS. *(E.)* Molling, K. (Max-Planck Inst. Virus Res., Tubingen, W. Germany), D. P. Bolognesi, H. Bauer, W. Busen, H. W. Plassmann and P. Hausen. *Bibl Haematol* (39):536-550, 1973.

Purified avian myeloblastosis virus (AMV) particles were disrupted with Nonidet and assayed for the presence of RNase H. A linear relationship existed between the amount of disrupted virus and the amount of RNA digested from a synthetic RNA-DNA hybrid. The DNA polymerizing activities from the virus particles sedimented at about 7.8S in sucrose density gradients; this material represented about 0.1% of the virus protein. The DNA polymerizing activity and RNase H showed a similar distribution pattern in the gradients. The RNase H complex was devoid of both endonuclease and exonuclease activities, which digest single-stranded DNA. RNase H and the RNA- and DNA-dependent DNA polymerizing activities

appeared to be contained within a single enzyme
lex. However, RNase H was much more stable
ng storage and handling than the DNA polymerase
vities, and the various enzyme activities in
isolated complex exhibited different require-
s for divalent cations. The rifampicin deri-
AF/ABDMP and, to a lesser extent, streptovari-
inhibited the activities of all three enzymes.
ssible viral replication mechanism involving
three enzyme activities is proposed: RNA seems
e used by the enzyme to synthesize complementary
resulting in an RNA-DNA hybrid. Later in the
tion RNase H specifically digests the RNA in the
id, thereby releasing single-stranded DNA.
single-stranded DNA becomes available, it might
be replicated to yield the final product.

3 STRUCTURAL STUDIES OF AVIAN MYELOBLASTOSIS VIRUS: ABSENCE OF LEUKEMOGENIC ACTIVITY
HE CORE COMPONENT. *(E.)* Stromberg, K. (Natl.
er Inst., Bethesda, Md.). *Proc Soc Exp Biol*
146(4):1111-1113, 1974.

omogenic effects of i.p. injections of core
arations of avian myeloblastosis virus (AMV)
examined in SPAFAS chickens to assay the *in*
biological activity of avian oncornaviruses.
se response comparison of AMV virions and AMV
s was made. Peripheral blood smears were used
etect myeloblastosis development starting one
after the injection for a period of seven weeks.
als which developed myeloblastosis were exsan-
ated and an autopsy was performed. Immediately
owing the observation period (seven weeks), all
ining animals were exsanguinated and autopsied.
ible viral infection without noticeable patho-
c effect in AMV core-injected chicks was checked
lectron microscopic evaluation of purified ser-
rom each animal. AMV virions and AMV cores were
ated by either isopycnic or velocity centrifu-
on. The AMV core component was not capable of
cing myeloblastosis at doses of 50 μg to 330 μg
iral protein/chick, while a myeloblastosis in-
nce of approximately 55% with velocity centri-
tion and 70% with isopycnic centrifugation of
virions was obtained. Myeloblastosis incidence
ed little with AMV virion dosage. The patho-
cal features of leukemia were confirmed by au-
y in virion-injected chicks which were myelo-
tic by peripheral blood smear. Analysis of
-injected chick serum showed no viral particles.
results show that removal of the outer envelope
he AMV virion eliminates the oncogenic effect
his avian RNA tumor virus. It is suggested that
inability of the core component to attach and
etrate the cell membrane explains this phenomen-

INTERACTION OF PURIFIED RIBONUCLEIC ACID DIRECTED DEOXYRIBONUCLEIC ACID POLYMERASE
VIAN MYELOBLASTOSIS VIRUS AND MURINE SARCOMA-
EMIA VIRUS WITH A RIFAMYCIN SV DERIVATIVE. *(E.)*
o, C. (Saint Louis Univ. Sch. Med., Mo.), D. P.
dgenett, G. F. Gerald and M. Green. *Biochemistry*
):708-713, 1974.

The mechanism of the 2,5-dimethyl-4-*N*-benzyldemethylrifampicin (AF/ABDMP)-induced inhibition of two RNA tumor virus DNA polymerases was studied. A rifamycin SV derivative inhibited the purified RNA-directed DNA polymerase of avian myeloblastosis virus (AMV) and the murine sarcoma-leukemia virus, Moloney strain [M-MSV(MLV)], by binding reversibly to the enzyme and not to RNA or DNA templates. The inhibitory effect of the drug could be overcome by the addition of excess template, and the inhibition could be completely reversed by dilution of the drug-enzyme mixture. The inhibition by AF/ABDMP was noncompetitive with respect to template and deoxyribonucleoside triphosphate substrates. Thus, the drug binds to a site different from the catalytic site for template and substrates. Preincubation of the AMV DNA polymerase with template reduced the inhibition by the drug. When high concentrations of the drug were added during polymerization, DNA synthesis continued unabated for at least one min before inhibition was observed; thus the drug acts at any early stage in DNA synthesis. The effect of different concentrations of AF/ABDMP on the initial rate of DNA polymerization suggests a cooperative binding of more than one drug molecule/enzyme molecule. These results were obtained with the AMV DNA polymerase with two subunits, α and β (molecular weight 65,000 and 105,000 daltons, resp.) and with AMV DNA polymerase which has a single polypeptide chain, α (65,000 daltons). A Hill plot of the kinetic data gave two slopes with *n* values of 3 and 7 with αβ AMV polymerase, the change in slope occurring at about 60% inhibition. A straight line was observed with α AMV DNA polymerase with an *n* value of 6.5. A Hill coefficient of 1 was obtained when *Escherichia coli* RNA polymerase was analyzed in the same manner. The drug may bind to a hydrophobic site on the enzyme which exerts a regulatory function on the initiation of DNA synthesis.

5540 STUDIES ON THE INTERRELATIONSHIP OF TYPE B AND TYPE C VIRUS PARTICLES IN BREAST CANCER AND IN LEUKEMIA.
(E.) Dmochowski, L. (Texas Med. Cent., Houston). *Bibl Haematol* (39):45-60, 1973.

A number of mouse mammary tumor cell lines haboring either type B or type C virus particles and a cell line (D-W) harboring both types of particles were used as model systems for morphological and immunological studies of the possible relationship of types B and C particles in tumors. In addition, spontaneous and induced mammary tumors in high- and low-leukemia strain mice, in which either type B or type C particles have been demonstrated, were used for morphological and biological studies of particle interrelationship. Electron microscopy demonstrated type B and/or type C virus particles; however, there was no morphological relationship between the two particle types, even when they developed from the same mammary tumor cell as found in the D-W cell line. Mixed hemadsorption and fixed immunofluorescence tests confirmed the presence of type B and type C particles and of their antigens in D-W cells and in various other cells. Immunoelectron microscopy showed no antigenic cross-reactivity between type B and type C particles produced by the same mouse mammary tumor cell. Bioassays in susceptible low-mammary tumor and low-leukemia BALB/c/DM mice showed either low mammary tumor activity or low-leukemia activity. The results of the bioassays did not correlate with the results of morphological observations. Mammary tumors which had type B particles showed either low-mammary tumor or leukemia-inducing activity and tumors with type C particles gave either low leukemia or low mammary tumor activity. This study indicates that the presence of the two types of particles in the same mouse mammary tumor does not imply involvement of both types in the origin of mouse mammary tumor or leukemia.

5541 INTERFERON INHIBITION OF AUTOGENOUSLY INDUCED VIRIONS (C PARTICLES) IN SYNCHRONIZED L-929 CELL CULTURES. *(E.)* O'Shaughnessy, M. V. (Dep. Microbiol., Dalhousie Univ., Halifax, Canada), K. B. Easterbrook, S. H. S. Lee, L. J. Katz and K. R. Rozee. *J Natl Cancer Inst* 53(6):1687-1690, 1974.

The effect of mouse interferon on the growth rate of L-929 cells was determined. Control cultures had doubling times of 15 hr. Incorporation of 400 U of interferon/ml into the culture medium increased the doubling time to 25 hr. The growth rate returned to that of control when the interferon was removed, even following five days exposure to high concentrations. The antiviral action of interferon was not reversible; viral replication was inhibited for a time equivalent to three to five cell generations following interferon removal. Interferon also delayed DNA synthesis and mitosis in synchronously growing cells. Interferon significantly decreased the production of C-type virions which was at its peak during metaphase in control cultures. In this culture system, the anticellular and antiviral activities of interferon appear to be separable phenomena.

5542 OBSERVATIONS ON THE RESISTANCE OF EPSTEIN-BARR VIRUS DNA SYNTHESIS TO HYDROXYUREA. *(E.)* Mele, J. (Coll. Med., Pennsylvania State Univ., Hershey), R. Glaser, M. Nonoyama, J. Zimmerman and F. Rapp. *Virology* 62(1):102-111, 1974.

The effect of hydroxyurea (HU) on the synthesis of Epstein-Barr virus (EBV) DNA in EBV-infected cells and drug activated EBV "negative" cells was studied. As monitored by induction of early antigen (EA), virus capsid antigen (VCA), and virus particles, the EBV genome was expressed in EBV "negative" D98/HR-1 somatic cell hybrids following *in vitro* treatment with iododeoxyuridine (IUdR). When the hybrid cells were treated with HU following IUdR-induction, total DNA synthesis was dramatically reduced, but the expression of EA and VCA was unaltered. The number of EBV genome equivalents increased following induction with IUdR in the presence of 5 mm HU. Synthesis of EBV-specific DNA proceeded to the same degree in HU-treated and -untreated lymphoblastoid cells infected with EBV, although HU treatment reduced total DNA synthesis by 85-90%. Cytosine arabinoside (ara-C) used instead of HU dramatically reduced cellular DNA synthesis and totally inhibited EBV DNA synthesis in IUdR-induced hybrid cells. Of all viruses tested thus far, EBV is unique in that EBV-specific DNA synthesis is refractile to HU-inhibition. Several mechanisms might explain this phenomenon: EBV infection may result in a breakdown of cellular DNA to the monophosphate level and virus specific DNA synthesis may occur in the absence of the *de novo* synthesis of DNA precursors; EBV infection may result in the induction of either a ribonucleotide reductase with altered specificity or a previously unexpressed host coded ribonucleotide reductase which is resistant to the inhibition of HU; or the EBV virion may code for its own ribonucleotide reductase, which may be partially or completely resistant to the action of HU.

5543 EPSTEIN-BARR VIRUS (EBV) IN LYMPHOID CELLS FROM PATIENTS WITH HODGKIN'S DISEASE. *(E.)* Diehl, V. (No affiliation). *Recent Results Cancer Res* 46:59-61, 1974.

A brief account was given of the *in vitro* growth of peripheral lymphocytes of Hodgkin's disease patients in relation to clinical and pathological parameters and Epstein-Barr virus reactivity in lymphoid lines derived from Hodgkin's disease patients. Peripheral lymphocytes were established *in vitro* in long-term cultures with a higher success rate than cells from normal individuals (47% compared to 18.2%). Lymphocytes from patients with localized disease (stages I and II) grew better than cells from patients with disseminated disease (stages III and IV). Establishment of continuously growing lymphoblastoid cultures depended on a positive serological Epstein-Barr virus reactivity of the cell donor and an intact cellular immune reaction. All patients had antibodies against Epstein-Barr virus-specific antigens. Epstein-Barr virus-specific antigens were detected in all but one long-term culture. It is suggested that the established lymphoblastoid cells are immunologically reactive cells and not Hodgkin-specific tumor cells.

5544 EPSTEIN-BARR VIRUS-BINDING RECEPTOR ON THE SURFACE OF CHRONIC LYMPHOCYTIC LEUKAEMIC LYMPHOCYTES. *(E.)* Gergely, L. (Med. U., Debrecen, Hungary), J. Czegledy, L. Vaczi and P. Gergely. *Experientia* 30(7):809-810, 1974.

Purified chronic lymphocytic leukemia (CLL) lymphocytes were incubated for 1 hr with Epstein-Barr virus (EBV)-producing P3HR-1 cells originating from a Burkitt lymphoma. The suspension was fixed on slides and stained with fluorescein isothiocyanate conjugated anti-EBV-VCA-MA (virus capsid antigen and membrane antigen) immune sera. The percentage of EBV-VCA antigen positive and rosette-forming P3HR-1 cells was the same. Only VCA antigen positive P3HR-1 cells were surrounded by CLL lymphocytes, while the VCA antigen negative cells did not form rosettes. This receptor was present on the surface of CLL lymphocytes after 1 week of cultivation *in vitro* and incubation with 10 μg/ml of puromycin HCl had no detectable effect on it. Thus, there is a stable EBV receptor on the surface of CLL lymphocytes.

5545 ELECTRON MICROSCOPY OF FELINE LEUKAEMIA VIRUS RNA. *(E.)* Whalley, J. M. (Anim. Leuk. Res. Unit, Univ. Glasgow, Scotland). *Bibl Haematol* (39):125-132, 1973.

ive and fully denatured feline leukemia virus
.V) 75S RNA samples were examined using the elec-
ı microscope. Comparison of the FeLV RNA samples
ı standard nucleic acid preparations indicated
: the native RNA is a long molecule (8.5 µm) of at
st 11 x 10^{-6} molecular weight U. Denaturation
FeLV RNA resulted in the production of short (1.4
or less) subunits of no more than 3 x 10^{-6} molecular
ght U. Thus, the change in sedimentation value
om 75S to 37S) of native RNA on denaturation
due to a break-down into these subunits as well
collapse of a previously uncoiled molecule.

5 CONTINUING STUDIES OF FELINE SARCOMA VIRUS-INDUCED TUMORS IN NONHUMAN PRIMATES. *(E.)*
n, H. (Natl. Cent. Primate Biol., Univ. California,
s), G. H. Theilen, D. L. Dungworth, P. S. Sarma,
. Nelson-Rees and R. W. Cooper. *Bibl Haematol*
:244-250, 1973.

development of tumors in six squirrel monkeys and
lapoin monkey was studied following the s.c. in-
ation of feline sarcoma virus (FeSV). Each ani-
received 1 g equivalent tumor extract except for
which received five graded doses ranging from 1.0
.0001 g equivalents. Nodules developed at the
of inoculation in all squirrel monkeys and sub-
ently regressed in four of the animals inoculated
ge two days or older. Undifferentiated sarcomas
loped in the remaining two inoculated on the day
irth. In the animal inoculated with graded doses
he day of birth, the sarcoma developed at the
of injection. The single talapoin monkey was
actory to tumor formation. Culture squirrel mon-
tumor cells were pleomorphic and contained no
ons in the original or early passage cells. Cul-
d cells derived from one tumor induced sarcoma
ittens and reacted positively with FeSV group-
ific antigen. Cultured cells from the other tumor
not react with the group-specific antigen.

FIBROMA VIRUS-INDUCED ACID DEOXYRIBONUCLEASE IN RABBIT KIDNEY CELLS. *(E.)* Sahu, S. P.
l. Vet. Med., Kansas State U., Manhattan) and
. Minocha. *Arch Gesamte Virusforsch* 44(1):14-
1974.

induction and characteristics of acid DNase in
ary rabbit kidney (PRK) cells from 7-10-day-old
its were studied following inoculation with fib-
virus. A 9- to 10-fold induction of DNase activ-
was detected at 48 hr after infection at pH 6.
ease in enzyme activity was proportional to in-
se in viral DNA synthesis. DNase activity in
plasmic extracts of cultures 48 hr after infect-
was maximal at pH 6, decreasing sharply at higher
alues and showing minimal activity at pH 9.0.
addition of 0.5 µg/ml of actinomycin D or 2 µg/ml
uromycin to cell cultures at the time of infection
bited enzyme induction, indicating a requirement
messenger RNA and *de novo* protein synthesis for
ction of DNase in infected cultures. The enzyme
infected cells required 2.5-20 µM Mg^{++}, with
mal activity at 5 µM. Heating at 50 C for 5
reduced the activity of the enzyme 86.5%; heating
10 min or longer completely eliminated enzyme
activity. Addition of increasing concentrations of a mixture of each of the four deoxyribonucleoside triphosphates in equal amounts also decreased enzyme activity.

5548 ANATOMICOPATHOLOGICAL DISCUSSION OF THE RELATION BETWEEN THE NON-SPECIFIC HEPATIC LESIONS IN HODGKIN'S DISEASE AND THE DETECTION OF AUSTRALIA ANTIGEN. *(Fr.)* Barge, J. (Beaujon Hosp., Paris, France), C. Degott, S. Erlinger and F. Potet. *Pathol Eur* 8(4):325-332, 1973.

Liver biopsies from 33 patients with Hodgkin disease were examined; these patients had been treated and had been in remission for two to three yr. In 16 cases, the liver was histologically normal; Australia antigen was found in the blood in four of these cases. Eleven biopsies showed isolated lesions of the mesenchyma, with Australia antigen present in six cases. Six biopsies showed lesions of the mesenchyma and of the parenchyma, with the Australia antigen present in all cases. Although 2 biopsies showed evidence of possible Hodgkin involvement of the liver, none of the biopsies revealed Hodgkin lesions of the hepatic parenchyma. There was no histological evidence of acute or chronic agressive hepatitis, but the findings are consistent with chronic persistent hepatitis. A significant correlation was found between the presence of Australia antigen in the blood and hepatic lesions.

5549 HERPESVIRUS DNA: STRUCTURE, SYNTHESIS, AND TRANSCRIPTION. *(E.)* Roizman, B. (Dep. Microbiol., Univ. Chicago, Ill.) and N. Frenkel. *Collect Pap Annu Symp Fundam Cancer Res* 25:364-396, 1974.

The buoyant density of herpes simplex virus type 1 (HSV-1) DNA was found to be 1.726; that of HSV-2, 1.728. Thermal denaturation studies showed melting temperatures for the two DNAs which differed by 1 C. The guanine + cytosine content of HSV-1 DNA was calculated to be 67%; that of HSV-2 DNA, 69%. In neutral sucrose density gradients, the two DNAs showed a sedimentation constant of 55S and a molecular weight of 99 ± 5 x 10^6 daltons. Reassociation kinetics indicated a molecular weight of 95 ± 1 x 10^6 daltons for unique sequences; repetitive sequences were not detectable. These data indicated that one DNA molecule per virion contained sufficient genetic information for virus multiplication and infectivity. In alkaline sucrose density gradients, the DNAs formed as many as seven bands, which included intact strands (49.5 x 10^6 daltons) and fragments (10-40 x 10^6 daltons). The size distribution of the fragments was consistent with the hypothesis that they arose from intact strands by single breaks at nonrandom sites. The fragmentation appeared to be the consequence of incomplete ligation or of ligation and repair of newly synthesized viral DNA; manipulative procedures and putative nucleases were excluded as possible causes of the fragmentation. For determining the levels of RNA in whole cells prior to viral DNA synthesis (2 hr postinfection) and at the time of appearance of changes in cell membrane characteristic of late infection

(8 hr postinfection), a technique was worked out based on hybridization of labeled viral DNA fragments with excess unlabeled whole cell RNA. Data obtained with this technique showed the existence of two RNA classes. At 2 hr, the more abundant class of RNA was present in a 140-fold excess over the scarce class; at 8 hr, a 40-fold excess. On the basis of molar concentrations and molecular weights of the RNA species, it was estimated that the viral RNA comprised 2.9% of the total RNA at 2 hr and 3.6% at 8 hr. To determine genetic relatedness of HSV-1 and HSV-2 DNAs, DNA-DNA hybridization studies were carried out. The results showed that approximately 40-50% of HSV-1 and HSV-2 DNAs were homologous. If HSV-1 and HSV-2 emerged from a common ancestor, it appeared to follow that one class of sequences, designated as variable DNA, evolved freely and are now subtype specific, whereas the second, designated as invariable DNA, evolved under constraints and is largely shared in common by the two subtypes. Results of studies on the complementarity of HSV-1 and HSV-2 DNAs serving as templates for abundant and scarce RNA species indicated that the invariant regions of the DNA consist of two classes of sequences, i.e., those transcribed for abundant RNA species and those transcribed for scarce RNA species. One interpretation of the minimal mismatching of base pairs observed in the invariant region of the DNA is that excessive changes in the amino acid sequence of the proteins specified by that region are lethal.

5550 THYMIDINE KINASES INDUCED BY AVIAN AND HUMAN HERPESVIRUSES. *(E.)* Kit, S. (Baylor Coll. Med., Houston, Tex.), G. N. Jorgensen, W. C. Leung, D. Trkula and D. R. Dubbs. *Intervirology* 2(5/6):299-311, 1973/74.

Disc polyacrylamide gel electrophoresis, isoelectric focusing, and glycerol gradient centrifugation experiments were carried out to characterize thymidine (dT) kinase isozymes induced by herpesvirus of turkeys and infectious laryngotracheitis virus in the cytosol fraction of infected chick cells. The avian herpesvirus dT kinases differed from chick cytosol dT kinase in electrophoretic mobility isoelectric point, and phosphate donor specificity. The avian herpesvirus dT kinases resembled chick mitochondrial dT kinase in electrophoretic mobility, isoelectric point, and but exhibited larger sedimentation coefficients. The avian herpesvirus enzymes closely resemble dT kinases induced by human simplex virus types 1 and 2. These observations support the hypothesis that the capacity of dT kinase induction may be a general property of herpesviruses, including the oncogenic herpesviruses.

5551 HERPES SIMPLEX VIRUSES TYPES 1 AND 2. TYPE AND STRAIN SPECIFIC CHARACTERISTICS AFFECTING VIRUS PLAQUE FORMATION. *(E.)* Lancz, G. J. (Coll. Med., Univ. South Florida, Tampa). *Arch Gesamte Virusforsch* 46(1-2):36-43, 1974.

Type and strain specific characteristics associated with plaque formation by the herpes simplex viruses were studied in three strains each of herpes simplex 1 and 2. A variety of primary and continuous tissue culture systems were examined for their ability to support herpes simplex virus plaque formation; seven of the cell types tested supported plaque formation by at least one herpes simplex virus strain. None of the cell lines tested could discriminate between all herpes simplex 1 and 2 strains by plaque formation. The addition of methyl cellulose to the overlay medium enhanced the sensitivity of the plaque assay for most of the herpes simplex type 1 strains but not the herpes simplex type 2 strains, suggesting a type-related effect. The plaque diameters produced by the herpes simplex type 2 strains were consistently larger than those produced by the type 1 strains. This type-specific characteristic was enhanced when the overlay medium was fortified with HEPES buffer. The results indicate that the relative efficiency of plaque formation in different cell lines, the effect of pH of the overlay medium on the efficiency of plaque formation, and the sensitivity of the plaque assay to overlay additives is independent of herpes simplex virus type.

5552 *HERPESVIRUS ATELES*, THE SECOND LYMPHOMA VIRUS OF MONKEYS. *(E.)* Melendez, L. V. (New England Reg. Primate Res. Cent., Southboro, Mass.), R. D. Hunt, F. G. Garcia, M. D. Daniel, C. E. O. Fraser, H. H. Barahona and N. W. King. *Bibl Haematol* (39):410-415, 1973.

Following the development of lymphosarcoma in two individuals who were caring for spider monkeys (*Ateles geofroyii*) in Guatemala, two new herpesviruses were isolated from these animals: Guatemala isolate AT-46 and *H. ateles*. Both viruses were isolated from primary kidney cultures and were serologically distinct both from each other and from *H. saimiri*. *H. ateles* was inoculated i.m. into two owl monkeys and three cotton-top marmosets. Within 40 days, all three marmosets had developed malignant lymphoma which closely resembled that induced by *H. saimiri*. The proliferating and invading cells were predominantly large lymphoblasts, and the animals developed terminal leukemia with up to 31% lymphoblasts in circulation. In a second experiment, 12 cotton-top marmosets were inoculated i.m. with *H. ateles*; all animals died within 26-32 days with malignant lymphoma of the lymphoblastic type and nine monkeys developed terminal leukemia. An unusual pathological feature of the lymphoma was the presence of large areas of necrosis in the spleen, lymph nodes, and thymus, probably due to infarction. No inclusion bodies were found in any cells, nor was there any other evidence to suggest viral cytocidal activity.

5553 STUDIES OF HUMAN CELLS INFECTED BY LEUKEMIA VIRUSES. *(E.)* Maruyama, K. (Dep. Virol., Univ. Texas, Houston), L. Dmochowski, J. J. Romero, S. H. Wagner and G. R. Swearingen. *Bibl Haematol* (39):852-870, 1973.

Fifteen human cell lines infected by murine or feline leukemia virus were studied immunologically, biologically, and electron microscopically to explore the role of type C virus particles in the pathogenesis of human leukemia and allied diseases.

The results of immunoferritin tests of murine leukemia virus (Rauscher) grown in mouse and human cells and of feline leukemia virus (Rickard) grown in cat and human cells demonstrated the presence of shared envelope antigens in the murine and feline leukemia viruses and in those viruses grown in human cells. The results also indicated the presence of new viral surface antigens shared by the viruses grown in human cells. The transformation of human cells derived from various neoplasms was observed following the inoculation of human cell-adapted murine leukemia virus or bone marrow from leukemic patients. The data indicated the presence of a filtrable agent(s) in the human cell cultures transformed following the inoculation of leukemic bone marrow. The agent(s) appeared to be capable of transforming human cells of various types (fibrosarcoma desmoides, giant cell tumor) and to induce RNA-directed DNA polymerase activity. Antigens shared with feline leukemia virus and canine leukemic cells were more strongly expressed in transformed human cells than in nontransformed control cells. Only one out of 166 human sera tested by mixed hemadsorption reaction contained antibodies to the surface antigens of the transformed cells.

5554 CELL KINETICS OF VIRALLY-INDUCED LEUKEMIAS. *(E.)* Fredrickson, T. N. (Dep. Anim. Dis., Univ. Connecticut, Storrs), E. F. Schultz, J. LoBue, P. Alexander, Jr., A. D. Rubin, A. S. Gordon and M. Schmidt. *Bibl Haematol* (39):992-1007, 1973.

Two-day-old chicks were inoculated intra-abdominally with plasma obtained from chickens with advanced myeloblastosis. Kinetic cycles and the production rates of leukemic myeloblasts and myelogenous precursors were compared in these chicks (leukemic) and nonleukemic controls. As predicted from studies of human leukemia patients and transplantable murine tumors, both of these parameters were similar in the leukemic and normal cells. A large pool of small leukemic myeloblasts with a low labeling index appeared to be characteristic of advanced avian myeloblastosis, with large, dividing cells being a distinct minority. The mean labeling index of blood myeloblasts was higher than that of marrow myeloblasts both *in vitro* and *in vivo*. Although anemia is characteristic of advanced cases of avian myeloblastosis, the cycles of erythroid precursors in this disease were similar to those in nonleukemic chickens. These results differ from those obtained in human leukemic patients and may represent some difference in the peripheralization of avian leukocytes. This was substantiated by labeling studies of cultured myeloblasts separated by density gradients. Both large and small myeloblasts had the capacity to attach to glass, and 2.8% of the myeloblasts showed phagocytosis of 1-9 latex particles.

5555 A COMPARATIVE STUDY OF MAREK'S DISEASE VIRUS PROTEINS. *(E.)* Nazerian, K. (Regional Poultry Res. Lab., ARS 3606 E. Mt. Hope Rd., E. Lansing, Mich. 48823), J. H. Chen and L. F. Lee. *Bibl Haematol* (39):518-523, 1973.

The proteins of partially purified Marek's disease virus (MDV) were studied by polyacrylamide gel electrophoresis. The virus particles were labeled with ^{14}C-labeled reconstituted protein hydrohydrate (RPH) or ^{3}H-glucosamine. Partial purification of MDV by centrifugation through 12-52% sucrose resulted in the formation of two visible bands: the upper band contained naked and enveloped virions, and the lower band contained primarily naked virions. Similar treatment of virus extracted from cells by nonidet P-40 resulted in the formation of one band composed mainly of naked virions. Electropherogram of MDV proteins revealed at least 8 different proteins (VPI-VPVIII) with molecular weights of 35,000-101,000 daltons. VPI was the major protein and had a molecular weight of 101,000 daltons. VPII appeared to be associated with viral envelope and viral glycoproteins. None of the other proteins were identified. A comparative study with herpes simplex virus and pseudorabies virus showed some minor differences, but VPI was quite similar in MDV and the other two viruses. This may reflect a common capsid antigen between these viruses.

5556 REVERSE TRANSCRIPTASE ACTIVITY: INCREASE IN MARROW CULTURES FROM LEUKAEMIC PATIENTS IN RELAPSE AND REMISSION. *(E.)* Mak, T. W. (Dep. Med. Univ. Toronto, Canada), M. T. Aye, H. Messner, R. Sheinin, J. E. Till and E. A. McCulloch. *Br J Cancer* 29(6):433-437, 1974.

Bone marrow specimens obtained from eight patients with either acute myeloblastic leukemia (AML) or acute lymphoblastic leukemia (ALL) and three non-leukemic patients were studied for reverse transcriptase activity before and following seven days culture in suspension. Reverse transcriptase activity was not detected in the marrow obtained from non-leukemic patients, both before and following the seven day culture. Reverse transcriptase activity was demonstrable in marrow from all eight leukemic patients, and was the lowest in the one patient in remission. Following culture, reverse transcriptase activity increased considerably in all leukemic patients, reaching similarly high levels. It was observed that the highest levels of activity were found in samples obtained from patients with ALL. This was seen both before and following culture. These findings are consistent with the view that transcriptase activity may be associated with leukoviruses.

5557 PROSTAGLANDINS AND CYCLIC NUCLEOTIDES IN MOLONEY SARCOMA TUMORS. *(E.)* Humes, J. L. (Dep. Zool. Physiol., Rutgers Univ., Newark, N.J.) and H. R. Strausser. *Prostaglandins* 5(2):183-196, 1974.

Amounts of prostaglandins and corresponding levels of cyclic nucleotides associated with Moloney sarcoma virus-induced tumors were determined in male BALB/c mice. Mice were injected i.m. with Moloney sarcoma virus which had been isolated from Moloney sarcoma virus-induced tumors. After sacrifice, the tumor was excised and prostaglandin content was measured by radioimmunoassay. A 53-fold increase in the amount of prostaglandin E and a 7-fold increase in prostaglandin F was found associated with the virus-induced tumors when compared with the amounts found in normal leg muscles from weanling BALB/c mice. There was a concomitant 2-fold increase in the concentration of cyclic AMP but no significant change in the concentration of cyclic GMP. The tumor tissue continued to synthesize relatively large amounts of prostaglandin E during a three hr incubation. The prostaglandins were primarily recovered in the incubation medium and were not retained in the tissues. Indomethacin, a prostaglandin synthetase inhibitor, prevented synthesis; arachidonic acid and dibutyryl-cyclic AMP failed to stimulate synthesis. The prostaglandin of the E series associated with the tumor was identified as prostaglandin E_2 by thin layer chromatography. It is suggested that the large predominance of the E-series prostaglandins in the tumor tissue could account for the 2.6-fold increase in cyclic AMP without a significant change in cyclic GMP.

5558 AKR MURINE LEUKEMIA VIRUS GENOME: FREQUENCY OF SEQUENCES IN DNA OF HIGH-, LOW-, AND NON-VIRUS-YIELDING MOUSE STRAINS. *(E.)* Lowy, D. R. (Natl. Inst. Allergy Infect. Dis., Bethesda, Md.), S. K. Chattopadhyay, N. M. Teich, W. P. Rowe and A. S. Levine. *Proc Natl Acad Sci USA* 71(9):3555-3559, 1974.

A single-stranded DNA probe complementary to the RNA of mouse-tropic AKR murine leukemia virus was used to study the viral-specific nucleotide sequences present in the cellular DNA of the high-virus-yielding mouse strains, AKR/J and C3H/FgLw, the low-virus-yielding mouse strains, BALB/cN, DBA/2N, C57BL/6J, and C3H/HeN, and the non-virus-yielders, NIH Swiss, C57L/J, 129/J, and NZB/N. Cellular DNA's were prepared from mouse embryos or tissues by a sodium dodecyl sulfate-Pronase-phenol method, sheared at 40,000 lbs /in^2, and filtered through a GA-6 filter. A single-stranded, virus-specific [^{3}H]DNA probe was synthesized in an endogenous RNA-directed DNA polymerase reaction using detergent-lysed, purified AKR virus. A representative viral [^{3}H]DNA probe had a specific activity of 2 x 10^7 cpm/µg, and was 98% single-stranded, 100% trichloroacetic acid-precipitable, and about 200-400 nucleotides in length. After hybridization with the probe at least 69% of the viral 70S RNA sequences were protected against single-strand-specific S-1 nuclease digestion and a saturating amount of 70S RNA protected 87% of the DNA probe sequences. The complete genome of the AKR-type murine leukemia virus was present in the DNA of high- and low-yielding strains, while DNA of non-virus-yielding strains contained only a part of the genome. In those strains where the genome was complete, two populations of virus-specific DNA sequences could be identified (more abundant and less abundant species) according to their rate of association with the probe. Low-virus-yielding strains contained fewer copies of the less abundant species and, consequently, fewer complete viral genomes than did high-virus-yielding strains. In the ten strains tested, there was a good correlation between completeness of the genome of AKR-type murine leukemia virus in cellular DNA and the capacity of the cells to release infectious AKR-type murine leukemia virus. The number of complete viral genomes correlated with the frequency of infectious virus production by virus-positive strains. DNA from wild mice also contained viral sequences, the sample tested showing reassociation kinetics identical to the non-virus-producing strains. All mouse DNA's studied contained seven or more copies of one portion of the AKR viral genome. It is suggested that this more abundant but incomplete set represents the same nucleotide sequences in all mouse DNA's.

5559 RAPID *IN VIVO* ASSAY FOR MURINE LYMPHATIC LEUKAEMIA VIRUSES. *(E.)* Decleve, A. (Stanford Univ. Sch. Med., Calif.), M. Lieberman, O. Niwa and H. S. Kaplan. *Nature* 252(5478):79-81, 1974.

A rapid *in vivo* endpoint dilution assay for wild-type radiation leukemia virus was developed using C57BL/Ka mice of both sexes. Wild-type preparations of radiation leukemia virus were extracted from radiation leukemia virus-induced lymphoma tissue. Serial five-fold dilutions of virus in medium containing Polybrene, 4 µg/ml, were injected in a volume of about 0.02 ml/lobe into one or both thymic lobes of groups of test mice. Thymus cell suspensions were prepared at serial time intervals thereafter, the cells kept in suspension on ice, and their concentration adjusted to 1 x 10^6 cell/ml. Indirect immunofluorescence staining of acetone-fixed cells was carried out for the detection of murine leukemia virus antigens. Direct examination of thymic lymphoid tissue for viral antigens by immunofluorescence was found to be straightforward since no nonspecific reaction with immunoglobulin-bearing lymphoid cells could be detected in the normal rat serum or saline controls. After direct intrathymic injection of radiation leukemia virus into one thymic lobe, virus-related antigens were first detected at seven days for virus dilutions ranging from 5^0 to 5^{-7}. When both lobes of the thymus were injected with 0.02 ml each of radiation leukemia virus, virus-related antigens were detected as early as two days after inoculations of high concentrations of virus. The highest dilution of radiation leukemia virus capable of inducing a lymphoma is also the highest dilution capable of infection and active virus replication in thymus cells, as revealed by the appearance of virus-related antigens in the cell cytoplasm. It is concluded that the endpoint dilution assay should prove useful in elucidating the sequence of events *in vivo* between the time of virus inoculation and the ultimate development of lymphomas induced by this and other thymotropic murine leukemia viruses.

5560 HOST CONTROL OF ENDOGENOUS MURINE LEUKEMIA VIRUS GENE EXPRESSION: CONCENTRATIONS OF VIRAL PROTEINS IN HIGH AND LOW LEUKEMIA MOUSE STRAINS. *(E.)* Strand, M. (Albert Einstein Coll. Med., Bronx, N.Y.), F. Lilly and J. T. August. *Proc Natl Acad Sci USA* 71(9):3682-3686, 1974.

Two of the major molecular components of murine leukemia virus particles, the internal protein (p30) and the envelope glycoprotein (gp69/71) were measured in the spleens of normal, 6-10-week-old mice

of various inbred strains and crosses. Radioimmuno-
assay measurement of the viral p30 and gp69/71 pro-
teins was carried out by a heterologous assay system
with anti-feline virus serum and murine virus protein.
The reaction mixtures contained the following: 5
µliter normal rabbit serum, 10 µliter of purified
virus or viral proteins as competing proteins, and
10 µliter of rabbit antiserum to Theilen feline
eukemia virus at a concentration that precipitated
approximately 50% of the ^{125}I-labeled antigen. The
reaction mixture was incubated at 37 C for 15-18 hr,
.04 ml of horse or goat anti-serum to rabbit IgG
added, incubation continued for an additional two
r followed by overnight incubation at 2-4 C. The
^{25}I-labeled antigen present in the precipitate
after centrifugation was measured in a gamma counter.
Both proteins were detected in virtually all mice.
Extracts of high leukemia, high murine leukemia
virus strains (AKR, C58, PL) showed high levels of
both proteins; extracts of other strains usually
showed lower levels. Very little gp69/71, however,
could be detected in spleens of BALB mice, and
his trait was dominant in crosses with AKR and
BA/2, both of which express a high level of gp69/71.
Thymus-deficient BALB/c-nu/nu mice, showed a higher
oncentration of gp69/71 typical of other low leu-
emia strains, suggesting that the virtual absence
f the protein in normal BALB/c mice may result from
mmunologic suppression. With C57L, C57BL/10Sn,
nd C57BL/6 strains the concentration of p30 was
ower, in some cases much lower, than would be ex-
ected from the concentration of gp69/71. DBA/2
ice showed high levels of gp69/71, ten-fold greater
han that of p30, whereas congenic DBA/2-*Fv*-1^b mice
howed the opposite pattern. Mice of 129-G$_{IX}^-$
train showed no detectable levels of either p30 or
p69/71 proteins, although the congenic 129(G$_{IX}^+$)
howed appreciable levels of both. The absence of
hese proteins in 129-G$_{IX}^-$ mice is a recessive
rait, as F$_1$ hybrids of AKR and DBA/2 showed appro-
riate levels of both proteins. It is concluded
hat expression of viral p30 and gp69/71 proteins
n mice is not coordinately linked and that ex-
ression is complex, being influenced by several
enes, including *Gv*-1, H-2, *Fv*-1, and probably
thers.

561 PROPERTIES OF ADENYLATE CYCLASE OF MURINE MAMMARY CARCINOMA.

(E.) Schorr, I. (Ha-
assah Univ. Hosp., Jerusalem, Israel) and A. Rus-
ell. *Biochim Biophys Acta* 364(2):173-180, 1974.

he activity of adenylate cyclase was studied in
ammary carcinoma tissue and normal lactating tis-
ue from BALBc mice infected through suckling by
3H mammary tumor virus-carrying mice. The enzyme
ctivity was identified primarily within the 1000 x
fraction of the whole homogenate of the carci-
oma tissue; it was not identified in the same
raction of the whole homogenate of the normal lac-
ating tissue. In the cancer tissue, the optimal
TP concentration for maximal enzyme activity ap-
eared to be 1 mM. The optimal incubation period
or the enzymatic reaction was five minutes, and
he optimal Mg^{2+} concentration for maximal adenylate
yclase activity was 6mM. However, in the presence
f 10 mM NaF, peak activity was observed at 8 mM
Mg^{2+}. Enzymatic activity peaked at pH 8.2 and was proportional to the protein concentrations between 0.23 and 1.86 mg/ml. Of a variety of hormones tested, only epinephrine consistently stimulated the enzymatic activity; this stimulation was completely inhibited by propranolol and almost unaffected by phentolamine. Essentially no enzyme activity was found in the 105,000 x *g* fraction of the carcinoma tissue. It is at present difficult to ascribe physiological significance to the prostaglandin effect on tumor cyclase.

5562 INTRACELLULAR AND VIRION 35 S RNA SPECIES OF MURINE SARCOMA AND LEUKEMIA VIRUSES.

(E.) Tsuchida, N. (St. Louis U. Sch. Med., Mo.) and M. Green. *Virology* 59(1):258-265, 1974.

RNA molecules from the following sources were treated with dimethyl sulfoxide to dissociate noncovalent aggregates and resolved by electrophoresis on polyacrylamide gels: 1) transformed murine sarcoma virus (murine leukemia virus)-producing BALB/3T3 cells; 2) transformed MSV(MLV)-producing rat cells; 3) MSV transformed, nonvirus-producing hamster cells; 4) MLV-producing BALB/3T3 cells; 5) MLV-producing NIH/3T3 cells; 6) 60-70 S RNA from MSV(MLV) virions; and 7) 60-70 S RNA from MLV virions. Two well-defined viral RNA species with sedimentation coefficients of 35 S and 20 S were detected in both MSV(MLV)-producing cell lines. The two MLV-producing mouse cell lines contained a well defined 35 S RNA peak, a somewhat less pronounced 20 S RNA peak, and heterogeneous RNA species of smaller molecular wt. Hybridization-competition experiments showed that 35 S RNA from cells replicating MSV(MLV) shares virtually all of its nucleotide sequences with MSV(MLV) 70 S RNA; these data suggest that intracellular 35 S RNA species are the major precursors to virion 70 S RNA.

5563 RNA TUMOR VIRUS AND REVERSE TRANSCRIPTASE. I. BIOCHEMICAL STUDIES ON THE ESP-1 PARTICLES. II. ROLE OF THE REVERSE TRANSCRIPTASE IN MURINE RNA TUMOR VIRUS.

(E.) Wu, A. M. (Bionetics Res. Lab., Bethesda, Md.), R. C. Ting, S. S. Yang, R. C. Gallo and M. Paran. *Bibl Haematol* (39):506-517, 1973.

The biochemical properties of the ESP-1 cell line, which was established from cells obtained from the pleural effusion of a child with lymphoma, were studied. The ESP-1 particles contained 70S RNAs and reverse transcriptase, and endogenous DNA products of these particles cosedimented with viral 70S RNA. Thus, the ESP-1 particles have the biochemical properties of an RNA tumor virus. The origin and oncogenicity in humans of ESP-1 particles remains unresolved. Investigation into the role of reverse transcriptase in neoplastic transformation revealed a direct correlation between the inhibitory effect of some derivatives of rifamycin SV on focus formation by murine sarcoma virus (MSV) or Rous leukemia virus (RLV) and their inhibitory effect on the reverse transcriptase activity of RLV. This suggests that reverse transcriptase is a necessary component of infectious RNA tumor viruses.

5564 DETECTION AND LOCALIZATION OF VIRUS-SPECIFIC DNA BY *IN SITU* HYBRIDIZATION OF CELLS DURING INFECTION AND RAPID TRANSFORMATION BY THE MURINE SARCOMA-LEUKEMIA VIRUS. *(E.)* Loni, M. C. (St. Louis Univ. Sch. Med., Mo.) and M. Green. *Proc Natl Acad Sci USA* 71(9):3418-3422, 1974.

DNA of the Harvey strain of the murine sarcoma-leukemia virus (MSV) was detected and localized in infected mouse 3T6 cells. Autoradiographs of nuclei of interphase MSV-infected and transformed mouse MEH cells were taken after *in situ* hybridization with viral (^{3}H) DNA (specific activity of 6.4 x 10^7 dpm/µg). Grain counts were performed on photographs at a magnification of 2080. The following grain densities/nucleus were recorded: uninfected 3T6 cells (5 ± 0.26), 3T6 cells five hr after infection (31 ± 1.55), 3T6 cells 11 hr after infection (66 ± 2.95), 3T6 cells 25 hr after infection (64 ± 2.44) and Harvey strain MSV-transformed mouse MEH cells (25 ± 1.09) and (23 ± 1.12). Cytological hybridization with the single-stranded Harvey strain MSV resulted in an increase in viral DNA sequences in mouse 3T6 cells after infection with Harvey strain MSV as compared with the established MSV-transformed mouse MEH cells. These results support the hypothesis that viral RNA-directed DNA polymerase functions to synthesize virus-specific DNA.

5565 INHIBITING EFFECT OF DISTAMYCIN A AND SYNTHETIC DERIVATIVES ON REVERSE TRANSCRIPTASE ACTIVITY AND ON MULTIPLICATION OF MURINE SARCOMA VIRUS. *(E.)* Di Marco, A. (Natl. Inst. Study Cure Tumors, Milan, Italy), P. Chandra, A. M. Casazza, F. Zunino, F. Giuliani and C. Soranzo. *Collect Pap Annu Symp Fundam Cancer Res* 25:290-299, 1974.

Distamycin A (DST), an antibiotic fraction exhibiting predominantly antifungal activity, is characterized chemically by three residues of 1-methyl-4-aminopyrrole-2-carboxylic acid. Two synthetic derivatives, DST-4 and DST-5, are characterized by four and five pyrrole residues, resp. When *in vitro* mouse embryo cell cultures were infected with Moloney murine sarcoma virus (MSV) and the infected cultures were treated with the different distamycins, the numbers of foci which formed were reduced, the effect being dependent on the dose used and increasing with number of pyrrole residues in the molecules. Although the cytotoxicity of the compounds increased at higher doses, it was always less than their inhibiting activity on foci formation. To determine if the reduced foci formation was due to inhibition of MSV replication, virus yields were measured at different days of infection of secondary mouse cell embryo cultures. DST, even at cytotoxic doses, poorly inhibited virus replication, while DST-4 was much more active against virus replication than against cell proliferation, and DST-5 was able to reduce viral yields by 92.3% at noncytotoxic doses. DST-4, when given to mice i.p. six times/day for six days, starting two days after infection with MSV, was able to inhibit and to reduce the growth of tumors induced by the infection. To determine whether the mechanism of action of the distamycins involved inhibition of reverse transcriptase, tests were carried out on the effect of the distamycins on DNA synthesis by MSV DNA polymerase in the presence of various templates. The inhibitory action which was observed increased according to the number of pyrrole residues. The effects on MSV reverse transcriptase were similar to those on corresponding enzymes of Friend leukemia virus and Rous sarcoma virus. A higher antiviral activity, as compared to cytotoxicity, of DST-4 and DST-5 suggests that an increase in the number of pyrrole residues leads to an increase in specific inhibition of virus-associated enzymatic activities.

5566 INHIBITION BY ETHIDIUM BROMIDE OF THE ESTABLISHMENT OF INFECTION BY MURINE SARCOMA VIRUS. *(E.)* Roa, R. C. (St. Louis Univ. Sch. Med., Mo.) and S. K. Bose. *J Gen Virol* 25(2):197-205, 1974.

The effects of ethidium bromide on the synthesis of a cellular product which is required for the successful establishment of infection of murine sarcoma virus were studied in BALB 3T3 mouse cells. Ethidium bromide at concentrations of 1 µg/ml or less was added to cultures of 3T3 cells 15 or 18 hr prior to infection, and 24 to 36 hr postinfection. The 3T3 cells were infected with Harvey murine sarcoma virus (containing murine leukemia virus) and incubated in growth medium containing 10 or 25 µCi/ml of [5-^{3}H]-uridine for 12 hr. There was a significant inhibition of virus production when 0.7 µg/ml of ethidium bromide was present from the time of infection, but there was no inhibition when the cells were treated with the drug 24 to 36 hr post-infection. The most drastic reduction in the synthesis of labeled virus particles occurred when the cells had been treated with ethidium bromide for 15 hr and the infection and subsequent culture carried out in drug-free medium. Pretreatment of 3T3 cells with 0.7 µg/ml of ethidium bromide for 18 hr rendered these cells grossly deficient in the ability to produce foci of transformed cells. The 3T3 cells were separated by differential sedimentation after a 15 hr treatment with 1 µg/ml of ethidium bromide; incorporation of both thymidine and uridine was drastically inhibited (82% and 75%, resp.) only in the mitochondrial fraction. These results suggest that BALB 3T3 cells in a specific phase of the cell cycle contain some material which is required for virus replication and that the accumulation of this material is prevented by ethidium bromide. The material in question may be a product formed subsequent to the replication of mitochondrial DNA, such as RNA or protein.

5567 ONCORNAVIRUS RELEASED FROM LONG-TERM CULTURES OF HUMAN LEUKEMIC CELLS. *(E.)* Shubladze, A. K. (D. I. Ivanovsky Inst. Virol., Moscow, USSR), I. F. Barinsky, F. P. Filatov, E. P. Ugriumov, A. F. Bocharov, G. A. Delimnetova, T. A. Bektemirov and V. M. Zhdanov. *Experientia* 30(10):1156-1159, 1974.

An attempt was made to obtain oncornavirus type-C-producing cell lines from human leukemic cells. Cells isolated from heparinized blood samples taken from patients with various forms of leukemia were grown in cell suspension. One C-particle positive leukocyte culture was assayed for reverse transcriptase and studied using electron microscopy and sucrose density gradients. Both the primary leukocyte culture and a human embryo fibroblast culture inoculated with the material from the original leukocytes contained C-type particles characteristic of oncornaviruses. The particles banded at 1.16 g/ml in sucrose density gradients and contained a high molecular weight RNA (70S) which is characteristic for oncornaviruses; the particles also contained reverse transcriptase. The results confirm the presence of C-particles in leukemic leukocyte cultures and demonstrate the possibility of transmitting the virus to human diploid cells.

5568 ONCORNA-VIRAL INFORMATION IN HUMAN MELANOMA. *(E.)* Birkmayer, G. D. (Dept. Cell Biol., U. Munich, W. Germany), B. R. Balda and F. Miller. *Eur J Cancer* 10(7):419-424, 1974.

Oncorna-viral information in human melanomas was studied using primary melanomas (9) and metastases to lymph nodes (5) and brain (1). RNA-instructed DNA polymerase activity was detected in all primary tumors and metastases. The specific activity of the DNA polymerase measurable in the microsomal fraction [MG P100] from the human tumors was comparable to that of the hamster melanoma A Mel 3, which contains an RNA tumor virus. Actinomycin D and, to a greater extent, ethidium bromide inhibited this activity. Very little DNA polymerase activity could be detected in the corresponding subcellular fraction from normal human skin. MG-P100 from the brain metastasis was separated into four protein fractions, the fourth of which exhibited the highest reverse transcriptase activity. The enzymic activity of this fraction was RNA dependent and stimulation by polynucleotide poly rA:oligo dT_{10} was similar to that of reverse transcriptase isolated from RNA tumor viruses. A single-stranded high-molecular wt (70S) RNA was identified in the fraction with the highest reverse transcriptase activity; this RNA served as a template for the RNA-directed DNA polymerase. In addition, electron microscopy revealed the presence of particles morphologically similar to C-type virions.

5569 MALIGNANT TRANSFORMATION OF CONDYLOMA ACUMINATUM: A LIGHT MICROSCOPIC AND ULTRASTRUCTURAL STUDY. *(E.)* Kovi, Joseph (Howard Univ. Coll. Med., Washington, D. C.), R. L. Tillman and S. M. Lee. *Am J Clin Pathol* 61(5):702-710, 1974.

Three cases of condyloma acuminatum (two female, one male) with malignant transformation are reported along with ultrastructural details of one case. Tissues were processed by formalin fixation and paraffin embedding, stained with uranyl acetate and lead citrate, and examined with a Zeiss EM9S-2 electron microscope. Aggregates of uniform, spherical 45-50 millimicron particles were detected in some nuclei of a benign condyloma, but were not detected in a condyloma showing malignant transformation in the same patient. The neoplasmic epithelium showed multinucleated, syncytial giant cells 35-60 millimicrons in diameter. Giant cell nucleoli frequently revealed the presence of a peripheral ring of RNA particles, with a light core containing 20-25 Å width chromatin-like fibrils. It is suggested that the aggregates found in the benign condyloma are suggestive of human papilloma (papova) particles, and that the absence of these particles is consistent with similar findings in the animal model, in which the development of malignancy is associated with the disappearance of the virus from the tissues.

5570 TEMPERATURE-DEPENDENT PROPERTIES OF CELLS TRANSFORMED BY A THERMOSENSITIVE MUTANT (*ts*-121) OF POLYOMA VIRUS. *(E.)* Hakura, A. (Res. Inst. Microb. Dis., Osaka Univ., Japan). *Biken J* 17(3):117-119, 1974.

The properties of cells transformed by the temperature sensitive mutant of polyoma virus, *ts*-121, that seem to control replicating ability in soft agar, are described. *Ts*-121 was isolated by hydroxylamine treatment from plaque purified SE-polyoma virus strain 105. The plaque forming ability of *ts*-121 was 10^{-4} or less at 39 C than at 35 C. A31-714 cells (recloned cell line from BALB/3T3 mouse) were transformed with UV-irradiated *ts*-121, and several independent cell lines were isolated. Each of the transformed cell lines was seeded onto six plates in 0.33% agar. Three replicate plates were incubated at 39 C for 30 days and the other three were incubated at 35 C for 40 days. All the transformed cell lines induced by UV-*ts*-121, except one, showed 12-20 times higher efficiency of colony formation at 35 C than at 39 C. Three cell lines transformed by the wild type virus showed similar efficiencies of colony formation at 35 C and at 39 C under the same conditions. These results indicate that the colony forming ability of the *ts*-121-transformed lines in soft agar was affected by temperature. Two possible explanations are offered for this low efficiency of colony formation at high temperatures: 1) the growth of these cells in soft agar may be temperature dependent; or 2) the low efficiency of colony formation at 39 C may be due to death of transformed cells at high temperature. The first explanation is taken as the more likely one because the ability of *ts*-121-transformed cells to grow to the contact-inhibited state in liquid culture is completely temperature dependent and cells cultivated in the contact-inhibited state still retain their replicating ability at 35 C after incubation for 25 days at 39 C. These observations suggest that the ability of transformed cells to grow in soft agar is closely related to the function of the *ts*-121 gene. The role of *ts*-121 gene in the regulation of growth of transformed cells in soft agar, however, is unknown.

5571 THYMIDINE KINASE INDUCTION IN MOUSE EMBRYO CELLS BY POLYOMA VIRUS. II. EFFECT OF 5-FLUOROURACIL. *(E.)* Zemla, J. (Inst. Virol., Slovak Acad. Sci., Bratislava, Czechoslovakia). *Acta Virol (Praha)* 18(6):467-473, 1974.

The influence of functional RNA synthesis on thymidine (dTR) kinase induction by polyoma virus was investigated in mouse embryo (ME) cells using 5-fluorouracil (FU). Confluent primary cultures of ME cells, grown in HS 10 or CS 10 medium, were used for infection. In order to reduce the dTR kinase activity, the cells were maintained for 24 hr before infection and also thereafter in a low serum medium

(HS 0.5). Polyoma virus strain SE was propagated in ME cells. Cultures were infected at a multiplicity of about 40 plaque forming U/cell for three hr. The results showed that dTR kinase was induced by polyoma virus in ME cells, but that this induction was not as high as expected. When 10 μg/ml FU was added before virus adsorption, the dTR kinase level was lowered a little more. The depression of the relative induction amounted on the average to 49.1% of the control. The virus growth was inhibited to a similar (or greater) extent in comparison with the induction of dTR kinase. The mechanism of action of FU seems possible either by a lowered activity of the enzyme due to its changed properties or by a reduced rate of formation of the enzyme due to impaired mechanisms controlling the expression of the respective gene.

5572 CLOSED CIRCULAR DNAs WITH TANDEM REPEATS OF A SEQUENCE FROM POLYOMA VIRUS. *(E.)* Folk, W. R. (Dep. Biol. Chem., Univ. Michigan, Ann Arbor) and H. E. Wang. *Virology* 61(1):140-155, 1974.

This report demonstrates that multiple infection of cells by polyoma virus will permit accumulation of defective viral genomes, one relatively homogeneous population of which contains repetitions of a subset of the polyoma genome. Plaque purified polyoma viral DNA from whole mouse embryo cells contains a sequence cleaved at a single site by R_1 restriction endonuclease (purified from *Escherichia coli* R_{204} RTF-1). The populations of closed, circular genomes found after several passages at moderate or high multiplicities had lost the R site, but their frequent occurrence indicated a selective advantage. Multiplicity of DNA synthesis initiation sites may provide this selective advantage since in multiply infected cells, only a few virions need structural coding genes. Gene duplication may also provide a means to increase the quantity of a mutationally altered enzyme. A model for the formation of these defective DNA loops is presented. The relative homogeneity of size may be due to limits imposed by encapsidation. One conclusion drawn from the study is that because of the tendency to produce heterogeneous forms of its genome, with loss and redistribution of DNA sequences, care must be taken in polyoma virus production. An important question raised by these defective genomes is whether they are capable of transforming cells.

5573 COLONY FORMING UNIT SUICIDE IN NORMAL AND RAUSCHER LEUKEMIC MICE GIVEN TRITIATED THYMIDINE *IN VIVO. (E.)* Okunewick, J. P. (Allegheny Gen. Hosp., Pittsburgh, Pa.) and E. L. Phillips. *Exp Hematol* 2:9-15, 1974.

The effect of large doses of high specific activity ^{3}H-thymidine on transplantable colony-forming units was evaluated in Rauscher leukemic female mice. Prospective recipient mice for the colony forming unit assay were exposed at 12 weeks of age to 950 rad x-ray. Ten-week-old mice were injected i.p. with 0.2 ml virus-containing serum 14 days before being injected with the tritiated thymidine. The thymidine was injected in two different manners: short-term (three 0.5 ml injections each of 0.25 mCi ^{3}H-thymidine, 20 min apart), and long-term (six equal injections, four hr apart). Both techniques resulted in a significant colony forming unit suicide in the leukemic mice and in the normal controls. In terms of relative proportion, approximately the same ratio of colony forming units were killed by the ^{3}H-thymidine in the Rauscher leukemic mice and in the controls. Analysis of the data indicated that in Rauscher leukemia a significant number of the new spleen colony forming units, which arise as a result of the leukemia, pass out of an actively cycling state into either G_0 state or a cycle in excess of 24 hr, and that the number of these is of the order of four times the total number of cycling and non-cycling colony forming units found in the normal mouse. It is suggested that Rauscher leukemia might serve as a suitable model for human cancers which are thought to produce a large number of non-cycling neoplastic cells.

5574 SEPARATION OF RIBONUCLEASE H AND RNA DIRECTED DNA POLYMERASE (REVERSE TRANSCRIPTASE) OF MURINE TYPE-C RNA TUMOR VIRUSES. *(E.)* Wu, A. M. (Dept. Molecular Biol., Natl. Cancer Inst., Bethesda, Md.), M. G. Sarngadharan and R. C. Gallo. *Proc Natl Acad Sci USA* 71(5):1871-1876, 1974.

Previous studies have indicated that ribonuclease H (RNA·DNA-hybrid ribonucleotidohydrolase) copurifies with the reverse transcriptase (RNA-directed DNA polymerase) of RNA tumor viruses and that viral specific ribonuclease H and the reverse transcriptase of avian type-C viruses are probably part of the same polypeptide. A fraction of the ribonuclease H activity from Rauscher murine leukemia and Kirsten murine sarcoma viruses was separated from reverse transcriptase by anion exchange chromatography while the remaining portion copurified with the viral polymerase. The amount of this copurified nuclease activity was about 4- to 8-fold lower than the activity found in the avian myeloblastosis virus (with respect to the ratio of ribonuclease H to reverse transcriptase); this nuclease activity could be detected only by using labeled substrate of high specific radioactivity. However, a complete separation of ribonuclease H activity from reverse transcriptase was achieved by purifying the core structures of the virus via sucrose density gradient centrifugation. While reverse transcriptase was present in the cores, there was no detectable ribonuclease H. Furthermore, a specific antibody against Rauscher leukemia virus reverse transcriptase did not inhibit any virion-associated ribonuclease H activity. These results suggest that these two enzyme activities reside in two separate molecules in the virions and probably in two different compartments of the virus. The data emphasize a basic difference between the avian and murine type-C virus DNA polymerases.

5575 DEVELOPMENT OF ERYTHROLEUKEMIA IN RAUSCHER VIRUS INFECTED MICE TREATED WITH PHYTOHEMAGGLUTININ. *(E.)* Lozzio, B. B. (Univ. Tennessee Mem. Res. Cent., Knoxville), A. Brown and J. P. Hewins. *Exp Hematol* 2(1):16-27, 1974.

e effect of prolonged treatment with phytohemag-
ıtinin on survival, hematologic picture and serum
terferon levels of normal BALB/c mice and those
fected with Rauscher leukemia virus was evaluated.
ce were given 0.3 ml of a leukemic spleen extract
ntaining approximately 10^3 to 10^4 ID_{50}/ml. Phyto-
magglutinin (100 mg/kg) was given i.p. twice week-
until death. Six groups of mice were treated
follows: 1) active phytohemagglutinin; 2) inac-
vated phytohemagglutinin; 3) Rauscher leukemia
rus; 4) Rauscher leukemia virus plus active phy-
hemagglutinin; 5) Rauscher leukemia virus plus
activated phytohemagglutinin; and 6) control mice
ven 0.3 ml of a 10% normal spleen extract or Ring-
's solution. Compared to untreated mice, admin-
tration of phytohemagglutinin significantly pro-
nged the survival of Rauscher leukemia virus-in-
cted mice, reduced the splenomegaly, lymphocyto-
s and peripheral erythroblastosis but did not
dify the terminal anemia and thrombocytopenia
aracteristic of this disease. As judged by iron
corporation, treatment of leukemic mice with phy-
hemagglutinin reduced the proliferation of splenic
ythroid cells, which appeared to be related to
e diminished splenomegaly and abnormal number of
rmoblasts and erythroblasts seen in the blood.
ly those mice treated with phytohemagglutinin had
slightly increased level of interferon. It is
ncluded that the results of this study are con-
stent with a preferential cytotoxic effect of
ytohemagglutinin-caused reduction in a finite
mber of target cells for Rauscher leukemia virus.

76 ISOLATION AND CHARACTERIZATION OF RETICULO-
ENDOTHELIOSIS VIRUS TRANSFORMED BONE MARROW
LLS. *(E.)* Franklin, R. B. (Dep. Microbiol., Univ.
xas, Austin), R. L. Maldonado and H. R. Bose. *In-*
rvirology 3(5-6):342-352, 1974.

ansformed cells were isolated from the bone marrow
reticuloendotheliosis virus-infected moribund
ickens. These cells were maintained *in vitro*
rough more than 30 serial passages. The cells in-
ıced solid tumors when inoculated (10^5 cells) into
e wing web of day-old chickens, and cell-free fil-
ates induced reticuloendotheliosis. Virus particles
ecovered after cocultivation of bone marrow cells
d chicken embryo cells banded at a density of 1.16
$/cm^3$ in sucrose gradients. The virions contained
S and 4S RNA species and a polypeptide composition
imilar to that of reticuloentheliosis virus. Com-
lement fixation tests indicated that viruses of the
ian leukosis-sarcoma complex were not present in
irus concentrated from these cultures. It is con-
luded that the virus produced by the reticuloendo-
eliosis virus-transformed bone marrow cells is
eticuloendotheliosis virus and not a member of the
ian tumor virus complex.

577 SARCOMA AND TRANSFORMATION-DEFECTIVE VI-
RUSES PRODUCED WITH INFECTIOUS DNA(S)
ROM ROUS SARCOMA VIRUS (RSV)-TRANSFORMED CHICKEN
ELLS. *(E.)* Hillova, J. (Inst. Cancerol. Immuno-
enet., Villejuif, France), D. Dantchev, R. Mariage,
. P. Plichon and M. Hill. *Virology* 62(1):197-208,
974.

Transfection with sarcoma and transformation-defective virus was investigated in chicken cell cultures. The DNA extracted from chicken cells transformed with helper-independent avian sarcoma viruses gave rise, in infectivity assays, to both transforming and transformation-defective viruses. Both viruses were recovered with a similar frequency at the end-point dilution (0.05 μg/DNA/10^7 cells) of infectious DNA. Increasing the DNA concentration had little influence on the probability of successful recovery of a sarcoma virus. The probability of recovering a transformation-defective virus increased when chicken cells received higher concentrations of DNA. Transformation-defective viruses recovered after transfection with DNA from Rous sarcoma virus (RSV)-transformed cells interfered with sarcoma viruses recovered with the same DNA or belonging to the same antigenic subgroup as the DNA parent. No interference was encountered between viruses produced with infectious DNAs of antigenically different parents. Interference patterns of a cloned transforming virus suggested that the transforming viral DNA progeny was independent of a helper virus. Both transformation-defective and transforming viruses possessed the same buoyant density of 1.168 g/cm^3. Viral RNA of the transformation-defective viruses sedimented slower than that of the transforming virus, the sedimentation coefficients being 65 S and 71 S, resp. In distinction to the sarcoma virus, a transformation-defective isolate did not give rise to tumors in bioassays. Chicken cells infected with the transformation-defective virus harbored infectious DNA which produced transformation-defective viruses in infectivity assays but was unable to generate a sarcoma virus. A transformation-defective virus isolated in these infections interfered with its sarcomatogenous ancestor. It is suggested that RSV-transformed chicken cells may carry two species of infectious DNA, one belonging to the sarcoma virus and the other to transformation-defective segregant. RSV-transformed mammalian cells appear to harbor only sarcoma viral DNA.

5578 REVERSE TRANSCRIPTION OF THE VIRAL GENOME ASSOCIATED WITH THE PLASMA MEMBRANE AFTER INFECTION WITH RNA TUMOR VIRUSES. *(E.)* Kakefuda, T. (Natl. Cancer Inst., Bethesda, Md.), C. W. Dingman, T. M. Bak, M. Hatanaka and Y. Kitano. *Cancer Res* 34(4):679-688, 1974.

Electron microscopic autoradiography of 3T3/BALB and chicken embryo cells infected with murine sarcoma virus or Rous sarcoma virus (RSV) showed ^3H-thymidine incorporation in the region of the plasma membrane beginning 1 hr after infection. The photopositive grains dispersed diffusely in the cytoplasm as the postinfection time was prolonged. Reverse transcriptase activity generated by virus infection was assayed by incubating isolated cell organelles in a transcription mixture with labeled deoxythymidine 5'-triphosphate. The DNA products were hybridized with viral RNA and then analyzed by isopycnic centrifugation in Cs_2SO_4 to determine whether any sequence homology existed. The plasma membrane showed the highest activity. DNA hybridizable to viral RNA was also isolated from the plasma membrane fraction of RSV-infected cells. These results indicated that the initial DNA copy of viral RNA is synthesized at the plasma membrane about 1 hr after infection and this synthesis continued for up to 7 to 10 hr. The DNA synthesized *in vitro* with isolated plasma membranes was found to consist of small homogeneous fragments having a molecular weight of about 1.5×10^5. In contrast, the virus-specific DNA synthesized in the living cells and extracted from the plasma membrane of RSV-infected chicken embryo cells was heterogeneous in size ranging from 10^5 to higher than 10^6 daltons. No evidence was found for virus-specific, reverse transcription associated with plasma membranes in uninfected cells. Neither microsomes, ribosomes, nor mitochondria were found to be involved in the initial transcription of viral RNA a short time after infection.

5579 EVIDENCE FOR COMMON NUCLEOTIDE SEQUENCES IN THE RNA SUBUNITS COMPRISING ROUS SARCOMA VIRUS 70 S RNA. *(E.)* Quade, K. (Duke U. Med. Ctr., Durham, North Carolina), R. E. Smith and J. L. Nichols. *Virology* 61(1):287-291, 1974.

RNA was extracted from purified ^{32}P labeled Prague strain of Rous sarcoma virus (subgroup C); 70S RNA was digested with T_1 ribonuclease. Electrophoresis and homochromatography were used to separate the components into 30 oligonucleotides. The amount of radioactivity of each spot was determined. From the radiation count of each large oligonucleotide and of the entire digest, the total number of RNA nucleotides was calculated. Assuming each nucleotide sequence to be present only once in a polypeptide chain, the total length of the RNA chain thus calculated would have to be smaller than previously assumed, and would barely have the coding capacity necessary for the virus. The results indicate that the RNA subunits possess both unique and shared nucleotide sequences.

5580 NUCLEAR LOCALIZATION AND COVALENT LINKAGE OF INFECTIVE VIRUS DNA OF NON-PRODUCER ROUS SARCOMA CELLS. *(E.)* Hillova, J. (Inst. Cancerol. Immunogenet., Villejuif, France), G. Goubin, D. Coulaud and M. Hill. *J Gen Virol* 23(3):237-245, 1974.

DNA was extracted from nuclei or whole rat XC cells transformed with a Prague strain of Rous sarcoma virus (RSV) to determine the location of the DNA in the cell. Chicken embryo cells (10^7) grown in primary culture were treated once with nuclear DNA (45.3 μg/2.5 ml of .14 M NaCl and .05 M-tris solution) or cellular DNA (52.5 μg/2.5 ml of .14 M NaCl and .05 M-tris solution). The specific infectivity was measured as total number of cell cultures transformed/μg DNA applied and yielded the following counts for nuclear and cellular DNA, respectively: 4/181.5 and 3/157.5. Transformed cultures produced C-type virus. XC cell DNA and SV40 reference species were centrifuged at 25,000 rpm and 4 C. The material sedimented into five regions which were assayed for infectivity. Cultures treated with regions corresponding to linear and superhelical SV40 DNA, mitochondrial DNA and fast-sedimenting fraction showed no virus production or cell transformation. One out of three cultures treated with the fraction corresponding to chromosomal 110S DNA did yield transforming virus. Inability to separate RSV DNA from chromosomal DNA via sedimentation and locating it in the nucleus of transformed cells indicates covalent bonding between the two species. Previous studies have indicated the same type of linkage between SV40 DNA and chromosomal DNA in SV40-transformed cells. The present results show separation of the SV40 reference DNA species and rule out the possibility of free viral DNA. Whether this integration is a prerequisite for virus replication remains to be demonstrated.

5581 CONDITIONAL TRANSFORMATION OF CELLS INFECTED WITH A MUTANT OF ROUS SARCOMA VIRUS. *(E.)* Bader, J. P. (Natl. Cancer Inst., Bethesda, Md.). *Biochem Dis* 4(Part B):661-666, 1974.

The nature of the basic biochemical defect responsible for the conversion of a functional responsible cell to a malignant irresponsible form was investigated. Cultures of chick embryo cells were infected with a temperature-sensitive mutant of the Bryan strain of Rous sarcoma virus (RSV-BH-Ta). The infected cells, morphologically normal at 41 C, showed a transformed morphology within 10 min after a shift to 36 C. Reversal to the normal morphology required several hr after shifting the temperature from 36 back to 41 C. All macromolecular requirements up through protein synthesis were found to be fulfilled at 41 C prior to the shift to 36 C, which suggests that the morphologic change at 36 C was likely due to a temperature-sensitive enzyme or structural protein. The RSV-BH-Ta-infected cells produced three to ten times as much hyaluronate at 36 C than they did at 41 C, but this change was dependent upon transcription of new RNA and synthesis of new protein, events which were not required for the morphologic change. RNA synthesis and protein synthesis were also required for an increased rate of hexose incorporation at 36 C. These biochemical changes were not induced merely by the morphologic change, and they may be independent of it. Low pH prevented the change to transformed phenotype and the increase in hyaluronate synthesis upon shifting the cells from 41 to 36 C, but did not prevent the increase in hexose uptake. The likelihood of attaining a biochemical definition of events leading to malignancy will be enhanced by eliminating the secondary changes which under other circumstances would make the problem unsolvable.

5582 ISOLATION AND CHARACTERIZATION OF THE A-TYPE OF LATENT HAMSTER VIRUS. *(E.)* Irlin, I. S. (USSR Acad. Med. Sci., Moscow), F. L. Kisseljov, Z. N. Tichonova, I. Z. Zaretsky and A. F. Bukovsky. *Bibl Haematol* (39):69-71, 1973.

S.c. or i.p. injection of hamster Rous tumor (HRT) cells into hamsters resulted in the induction of tumors at the site of injection in all animals. HRT cells did not produce infectious Rous virus unassociated with the cells. HRT cells produced A-type viral particles which contained RNA. Disrupted A-type particles did not contain Rous specific antigen of Rous virus and A-type particles did not produce tumors in hamsters, rats, mice or chickens. Rabbits immunized with the A-type particles did not contain complement-fixation activity against Rous virus.

5583 HETEROGENEITY OF SIMIAN VIRUS 40 POPULATIONS: VIRUS PARTICLES CONTAINING ONE OR TWO VIRUS DNA MOLECULES? *(E.)* Sokol, F. (Wistar Inst. Anat. Biol., Philadelphia, Pa.), F. K. Heubner, K. B. Tan, M. C. Sheehan and D. Santoli. *J Gen Virol* 22(1):55-71, 1974.

A type of heterogeneity in SV40 populations grown in monkey kidney cells which is not dependent on input multiplicity was investigated. Simian virus 40 (SV40) was grown in African green monkey kidney or CV-1 cells, pre-purified by centrifuging in a steep KBr density gradient, and centrifuged to equilibrium in CsCl density gradient. Three distinct bands were discernible. The particles in the major band had a buoyant density of 1.35 g/ml, and those in two minor bands equilibrated at 1.325 and 1.30 g/ml. Examination under the electron microscope showed that the bands at 1.35 and 1.325 g/ml density contained virus particles with shape, size and surface structure characteristic of SV40, but that the band at 1.30 g/ml density was composed mostly of coreless "empty" capsids. The proportion of the three virus forms varied somewhat in different preparations, but was independent of the input multiplicity in the range of 0.1 to 100 plague-forming units of SV40 cell. The specific infectivity of heavy virus was about ten times larger than that of light virus, but the specific infectivity of virus DNA isolated from these virus forms was similar. Neither light nor heavy virus fractions contained lipids. The protein moiety of the three particle forms was composed of the same polypeptides in similar proportions. DNA extracted from the light virus fraction sedimented at a rate identical to that of DNA from heavy virus both in neutral and alkaline sucrose density gradients. The two DNAs hydridized with the same efficiency with the DNA from heavy virus and banded together after isopycnic centrifuging in CsCl solution containing ethidium bromide, indicating structural similarity. The protein-to-DNA ratio in the light virus fraction was twice that in the heavy virus fraction. It is suggested that either heavy virus particles contain two double-stranded, circular DNA molecules of identical molecular size, and light particles contain one, or the light virus fraction contains aggregates of heavy virus and particles devoid of DNA in equal proportion.

5584 PROPERTIES OF SV40 RESCUED FROM ACTINOMYCIN D-SENSITIVE AND ACTINOMYCIN D-RESISTANT TRANSFORMED HAMSTER CELLS. I. LYTIC INFECTION. *(E.)* Suarez, H. G. (Inst. Sci. Res. Cancer, Villejuif, France), R. Cassingena, S. Estrade, R. Wicker, Ch. Lavialle and P. Lazar. *Arch Gesamte Virusforsch* 46(1-2):93-104, 1974.

Simian virus 40 recovered from TSV-5 Cl.2 (an established clonal cell line derived from a s.c. tumor induced in golden Syrian hamsters by Simian virus 40 large plaque type; actinomycin D-sensitive) and from TSV-5 Cl.2/R [an actinomycin D-resistant (2 μg/ml) line established by cultivating TSV-5 Cl.2 cells in medium containing increasing concentrations of the antibiotic (0.01-2 μg/ml)] was compared with respect to plaque size and the mechanism of plaque formation. Virus rescued from the actinomycin D-sensitive cells was a large plaque variant of simian virus 40 while virus rescued from the actinomycin D-resistant cells was a small plaque variant. Plaque formation was studied by infecting one-day old CV-1 and Vero African green monkey kidney cell monolayers with approximately 10 plaque forming units of either the small plaque variant or the large plaque variant. Plaque formation in the presence or absence of diethyl-aminoethyldextran was investigated in CV-1 monolayers. The effects of sonication and heat inactivation were also studied as was the synthesis of tumor and capsid antigens and of infectious viral DNA. The size difference between the large plaque and the small plaque variants was identical in the CV-1 and Vero cell cultures and was unchanged in the presence of diethyl-aminoethyldextran or when sonicated viral suspensions were used. It is thus unrelated to the particular indicator cell system used. It is concluded that the difference in plaque formation is related to the growth rate of the two virus strains, and that the slower growth rate of the small plaque variant is partly, or exclusively, due to the fact that replication of viral DNA is affected.

5585 MODIFICATIONS IN THE CHROMOSOMAL PROTEINS OF SV-40 TRANSFORMED WI-38 HUMAN DIPLOID FIBROBLASTS. *(E.)* Krause, M. O. (Dept. Biochem., U. Florida, Gainesville) and G. S. Stein. *Biochem Biophys Res Commun* 59(2):796-803, 1974.

The composition and metabolism of the chromosomal proteins associated with the genomes of WI-38 human diploid fibroblasts and simian virus 40 (SV40)-transformed WI-38 fibroblasts were compared. All five principal histone fractions were present and actively synthesized in both normal and SV40-transformed WI-38 cells. However, variations in the relative amounts and rates of synthesis of specific histone fractions were evident. Specifically, there was an increase in the relative amount of F2A2 and a decrease in the relative amount of F3 in the SV40-transformed cells. A relative increase in ^{3}H-amino acid incorporation into F1 paralleled the relative increase in the protein content of this histone fraction in the transformed cells. F2A1 exhibited relatively lower ^{3}H-amino acid incorporation in the transformed cells. There was also an increase in the relative specific activity of F3 and a decrease in F2A2 and F2A1 in the SV40-transformed cells. The histone fractions from the transformed cells showed increased resolution in SDS polyacrylamide gels sliced into 46 fractions. In addition, the transformed cells exhibited a marked increase in the synthesis of high-molecular wt nonhistone chromosomal proteins and a decreased synthesis of nonhistone chromosomal fractions migrating between gel fractions 25-30; there were also differences in the banding patterns of nonhistone chromosomal proteins migrating between gel fractions 1-18. The observed modifications in the histones and nonhistone chromosomal proteins of SV40-transformed WI-38 human diploid fibroblasts may be functionally related to alterations in the gene expression associated with viral transformation.

5586 ANIMAL DNA-DEPENDENT RNA POLYMERASES. STUDIES ON THE BINDING OF MAMMALIAN RNA POLYMERASES AI AND B TO SIMIAN VIRUS 40 DNA.

(E.) Hossenlopp, P. (Fac. Med., Strasbourg, France), P. Oudet and P. Chambon. *Eur J Biochem* 41(2):397-411, 1974.

The binding of purified mammalian (calf thymus and rat liver) RNA polymerases AI and B to Simian virus 40 DNA was studied under various conditions (ionic strength, divalent cation, temperature) by two complementary methods, electron microscopy and retention of enzyme DNA complexes on nitrocellulose filters. These studies showed that there are multiple binding sites for mammalian RNA polymerases on Simian virus 40 DNA form I and that highly stable enzyme·DNA form I complexes are formed. In contrast to the bacterial RNA polymerase holoenzyme, the purified mammalian enzymes were unable to form a highly stable complex with a linear double-stranded DNA (Simian virus 40 DNA form III). It is suggested that the formation of highly stable complexes between the mammalian enzymes and Simian virus 40 DNA form I in the absence of divalent cations or in the presence of Mn^{++} most probably reflects the binding of enzyme molecules to the unpaired region(s) which is present in superhelical DNAs. It has not yet been determined whether the nonpairing for a specific region of superhelical simian virus 40 DNA form I could serve as a physiological promoter sequence for the preferential binding of either of the two types of mammalian RNA polymerases.

5587 STIMULATION OF 2-DEOXYGLUCOSE UPTAKE IN GROWTH-INHIBITED BALB/c 3T3 AND REVERTANT SV40-TRANSFORMED 3T3 CELLS.

(E.) Bradley, W. E. C. (Sch. Med., Case Western Reserve U., Cleveland, Ohio) and L. A. Culp. *Exp Cell Res* 84(1/2):335-350, 1974.

Sugar transport in the contact-inhibited BALB/c 3T3 and revertant simian virus 40 (SV40)-transformed 3T3 cells was markedly diminished when these cells became growth-inhibited. Insulin rapidly stimulated transport in both normal 3T3 and revertant cells, when they were contact inhibited, by increasing the Michaelis-Menten kinetic parameter V_{max}, possibly reflecting a rapid increase in the number of transport sites on the surface of these cells. Insulin had no effect on sugar transport in SV40-transformed (SVT2) cells, growing 3T3 cells, or growing revertant cells. Increasing concentrations of fresh fetal calf serum stimulated transport in contact-inhibited 3T3 and revertant cells to levels identical with those in growing cells; this correlated with its ability to 'turn on' DNA synthesis in the vast majority of these cells. This stimulation was maximal at serum concentrations of 35-80%. The mechanisms of stimulation for the two cell types were quite different. Stimulation of transport in 3T3 cells was initially rapid with an increase in V_{max} followed 1 hr later by a second increase resulting from a diminished K_m. Stimulation in the revertant cells proceeded slowly and linearly and was a result of an creased V_{max} with no apparent change in the K_m consta Although the revertant cells exhibited sugar transport properties which, in general, resembled those in normal 3T3 cells and not those in their parental SVT2 cells, the mechanisms of transport changes were quite different. With regard to the stimulation of transport, conditioned fetal calf serum was partially able to stimulate the uptake of 2-deoxyglucose by confluent 3T3 cells, while the uptake of 2-deoxyglucose by serum-stimulated 3T3 cells was not further stimulated by treatment with fresh serum. The serum was modified by the cells in that it lost its ability to cause the decrease in K_m; this correlated with the loss in its ability to induce DNA synthesis in these cells.

5588 SUPERHELIX DENSITY OF REPLICATING SIMIAN VIRUS 40 DNA MOLECULES.

(E.) Sebring, E. D. (Natl. Inst. Allergy Infect. Dis., Bethesda, Md.), C. F. Garon and N. P. Salzman. *J Mol Biol* 90(2):371-379, 1974.

Simian virus 40 replicating DNA molecules were isolated and fractionated according to the extent of replication by isopynic centrifugation in ethidium bromide-CsCl. Electron microscopic examination of the replicating molecules in the presence of ethidium bromide revealed that the sense of the superhelix in replicating molecules is the same as that of simian virus 40 DNA I. DNA molecules of differing extents of replication were also analyzed by sedimentation in varying concentrations of ethidium bromide (0.4 to 100 g/ml). The superhelix density of the unreplicated portion of replicating molecules was greater than that of DNA I and increased as the degree of replication increased. All replicating molecules contained a rather constant number (two to five) of additional superhelical turns/molecule, irrespective of the extent of replication. This suggests that a region (or regions) of about 20 to 50 nucleotides may exist in a denatured state in replicating molecules, presumably at the replicating forks of the molecule.

5589 ENHANCEMENT OF SIMIAN VIRUS 40-INDUCED TRAN FORMATION OF CHINESE HAMSTER EMBRYO CELLS BY 4-NITROQUINOLINE 1-OXIDE.

(E.) Diamond, L. (Wista Inst. Anat. Biol., Philadelphia, Pa.), R. Knorr and Y. Shimizu. *Cancer Res* 34(10):2599-2604, 1974.

The conditions under which the chemical carcinogen 4-nitroquinoline 1-oxide enhances simian virus 40 (SV40) induced transformation in Chinese hamster cells were investigated. Chinese hamster embryo cells were grown in complete medium and plated in soft agar medium. Th cultures were incubated for two hr with 4-nitroquinoli 1-oxide (4NQO) and (either before or after) were injected with SV40 at a multiplicity of 25-50 plaque-forming U/cell. 4NQO-pretreatment enhanced the frequency of SV40-induced transformation in the cells. Treatment with 4NQO (0.4 μg/ml, 2-7 hr preinfection) produced a 2-10-fold increase in transformation, while treatment up to eight hr postinfection enhance transformation 2-3-fold. All the cells transformed by 4NQO

+ SV40 or by SV40 alone contained SV40 T-antigen as indicated by the indirect immunofluorescence technique. Although 4NQO was cytotoxic, the enhancement of transformation was not due to a selection of virus-susceptible, 4NQO-resistant cells present in the original population since the transformed cells showed no increase in resistance to 4NQO cytotoxicity. Cells transformed by 4NQO + SV40 had a lower growth potential during subsequent propagation than did cells transformed by SV40 alone. There is some evidence that the primary effect of 4NQO on transformation may be an early event, with enhanced viral integration being a secondary effect.

590 ACTIVATION OF SIMIAN VIRUS 40 BY TRANSFER OF ISOLATED CHROMOSOMES FROM TRANSFORMED CELLS.

E.) Shani, M. (Dep. Genet., Weizmann Inst. Sci.,
ehovot, Israel), E. Huberman, Y. Aloni and L. Sachs.
irology 61(1):303-305, 1974.

letaphase chromosomes isolated from an inducible simian
irus 40 (SV40)-transformed Chinese hamster cell line
ere transferred into SV40-permissive BSC1 cells to
letermine the effects of such a transfer on the acti-
ation of SV40. No T-antigen or infectious virus was
bserved after treatment with sonicated chromosomes,
ysates, or from transformed cells or with transformed
ell DNA. However, fusion of the SV40-transformed
ells with BSC1 cells yielded infectious virus. This
irus was of the minute plaque type although the virus
tock which transformed the original cells was of the
arge plaque type. Activation of the SV40 genome in
he BSC1 cells following treatment with SV40-trans-
ormed cell metaphase chromosomes was indicated by the
ppearance of SV40-specific T-antigen 72 hr after treat-
ent. A typical SV40 cytopathic effect was first de-
ected 16-21 days after treatment. Thirty of 112 cul-
ures produced infectious virus after treatment with
he chromosomes from the transformed cells; the plaques
ere of the minute plaque type. The activation of virus
as dependent on the integrity of the chromosomes and
n their age after isolation.

591 *IN VIVO* INCORPORATION OF CYTOSINE ARABINOSIDE INTO SIMIAN VIRUS 40 DNA.

(E.) Man-
euil, S. (Inst. Sci. Res. Cancer, Villejuif, France),
. Kopecka, J. Caraux, A. Prunell and M. Girard.
Mol Biol 90(4):751-756, 1974.

nhibition of simian virus 40 DNA replication by
ytosine arabinoside was investigated to determine
f it is the incorporation of cytosine arabinoside
nich arrests DNA elongation. A preliminary ex-
eriment using CV_1 cells infected with the large
laque strain of simian virus 40 showed that the
ffect of cytosine arabinoside was essentially ir-
eversible while that of other inhibitors was
asily reversible. The simian virus 40-infected
ells were labeled with tritiated cytosine arabino-
ide (20 μg/ml). Cytosine arabinoside was incorpora-
ed into growing viral DNA strands, the overwhelming
ajority being in internucleotide linkage, 2 to 3%
eing recovered as 3' OH terminal residues. This
nplies that arrest of simian virus 40 DNA chain
longation by cytosine arabinoside is not due to
ere addition of one cytosine arabinoside residue
the growing DNA strand. When simian virus 40-infected CV_1 cells were treated with 2 μg tritiated cytosine arabinoside there was approximately 70% inhibition of simian virus 40 DNA synthesis within 30 min after the addition of the drug. The tritiated cytosine arabinoside label accumulated in the simian virus 40 supercoiled DNA component I molecules, which had the behavior of component I DNA at alkaline pH. It is concluded that cytosine arabinoside is incorporated at random into simian virus 40 DNA, where it is inserted in alkali-resistant internucleotide linkage and that it is not the incorporation of cytosine arabinoside which arrests DNA synthesis. It is suggested that the irreversible effect of cytosine arabinoside on simian virus 40 DNA replication may be due to cumulative incorporation of several molecules of the analog into the same growing DNA strand, eventually resulting in alterations in the DNA helix.

5592 THE PROTEIN COMPOSITIONS OF SV40 AND POLYOMA VIRUS.

(E.) Murakami, W. T. (Grad. Dep. Biochem., Brandeis Univ., Waltham, Mass.) and B. S. Schapphausen. *Collect Pap Annu Symp Fundam Cancer Res* 25:43-62, 1974.

Particles of both SV40 and polyoma virus are icosahedral, 45 mμ in diameter, with 72 capsomeres and weights of 24 x 10^6 daltons, based on 12.5% DNA content for each. Their DNAs consist of 3 components, with sedimentation coefficients of 21, 16, and 14-14.5S. The proteins of the two viruses also are similar to one another, although their possible identity was not brought out. Polyoma virus, subjected to SDS-polyacrylamide gel electrophoresis, revealed seven components, of which three, designated capsid subunit, dimer and trimer, were shown to originate from the capsid. The remaining four components, designated bands 1, 2, 3, and 4, appeared to represent internal components of the virion. The apparent molecular weights of the polyoma virus capsid proteins, as determined by SDS-polyacrylamide gel electrophoresis, depended to some degree on the concentration of the acrylamide, with the subunit monomer having a molecular weight of 53,100 ± 3,000 in 10% acrylamide, 44,500 ± 4,000 in 5% acrylamide. The internal virion proteins had lower molecular weights, ranging from about 15,000 to 35,000. Somewhat lower values of molecular weight were obtained by exclusion chromatography in guanidinium chloride. Amino acid compositions were found to be identical for the dimer and subunit protein bands; that for band 3 was closely similar to that of cellular histone F2b. Further study supported the conclusion that band 3 is comprised of two components, histones F2b and F3. It is suggested that the apparent incorporation of cellular histones into polyoma virions may be simply a consequence of the cell nucleus replication site of the viral DNA. The histones may play a structural role in the condensation of the DNA prior to encapsidation.

5593 STUDIES ON THE MOLECULAR WEIGHT OF THE ADENOVIRUS TYPE 2 HEXON AND ITS SUBUNIT.

(E.) Grutter, M. (Biol. Cent. Univ. Basel, Switzerland) and R. M. Franklin. *J Mol Biol* 89(1):163-178, 1974.

5594 DIFFERENT STAGES OF TRANSFORMATION OF ROUS VIRUS-INFECTED CELLS EVIDENCED BY METHLYENE BLUE STAINING. *(E.)* Barlati , S. (Lab. Genet. Biochem. Evol. CNR, Pavia, Italy), C. Kryceve and P. Vigier. *Intervirology* 4(1):23-30, 1974.

5595 INTERACTION OF CHINESE HAMSTER EMRYONIC CELLS WITH THE HELPER-DEPENDENT ROUS SARCOMA VIRUS. *(E.)* Hlozanek, I. (Inst. Exp. Biol. Genet. Prague, Czechoslovakia), J. Lacinova and O. Mach. *Folia Biol (Praha)* 20(5):291-299, 1974.

5596 TUMOUR VIRUSES AT MUNICH. *(E.)* Anonymous. *Nature* 252(5483):530-531, 1974.

5597 VIRAL PATHOGENESIS AND IMMUNE RESPONSIVENESS IN MSV-SD INFECTED RATS. *(E.)* Evans, D. L. (Sch. Med., Texas Tech. U., Lubbock). *J Reticuloendothel Soc [Suppl]* 16:44a, 1974.

5598 *IN VIVO* ACTIVATION OF ENDOGENOUS MURINE 'C' TYPE VIRUS. *(E.)* Axler, D. A. (Battelle's Columbus Labs., Ohio) and A. J. Dennis. *J Reticuloendothel Soc [Suppl]* 16:44a, 1974.

5599 *IN VITRO* IMMUNE ACTIVATION OF ENDOGENOUS 'C' TYPE VIRUS. *(E.)* Dennis, A. J. (Battelle's Columbus Labs., Ohio) and D. A. Axler. *J Reticuloendothel Soc [Suppl]* 16:45a, 1974.

5600 CANCER AND VIRUS. *(Por.)* Fonti, C. (Internatl. Oncol. Cent., Milan, Italy). *An Paul Med Cir* 101(2):73-75, 1974.

5601 STUDY OF A MURINE ONCORNA VIRUS RNA WITH LOW MOLECULAR WEIGHT: RNA "8 S" OF MURINE SARCOMA VIRUS (MSV-M-MLV). *(Fr.)* Emanoil-Ravicovitch, R. (Lab. Exp. Hematol., Saint-Louis Hosp., Paris, France), C. J. Larsen, J. Robin, M. Bazilier and M. Mauchauffe. *Arch Int Physiol Biochem* 82(4):771, 1974.

5602 HEPATITIS, INFECTIOUS MONONUCLEOSIS AND EPSTEIN-BARR VIRUS. A CASE REPORT. *(Fl.)* Vadasz, T. A. (St. Joseph Hosp., Veghel, Belgium) and J. de Groote. *Tijdschr Gastroenterol* 17(2):115-118, 1974.

5603 SARCOMA IN A HAMSTER INOCULATED WITH HUMAN PAPOVAVIRUS, BK VIRUS. *(E.)* Shah, K. V. (Johns Hopkins Univ. Sch. Hyg., Baltimore, Md.), R. W. Daniel and R. Warszawski. *Fed Proc* 33(3):753, 1974.

5604 MURINE LEUKEMIA VIRUS EXPRESSION IN CELL-PASSAGED LYMPHOMAS. *(E.)* Vredevoe, D. L. (Lab. Nucl. Med. Radiat. Biol., Univ. California Los Angeles) and E. F. Hays. *Fed Proc* 33(3):753, 1974.

5605 SCANNING ELECTRON MICROSCOPY (SEM) OF MAMMARY TUMOR VIRUS (MTV) BUDDING FROM C3H MOUSE MAMMARY TUMOR CELLS IMMUNOLOGICALLY LABELED WITH TOBACCO MOSAIC VIRUS (TMV). *(E.)* Nemanic, M. K. (Cancer Res. Lab., Univ. California, Berkeley) and D. P. Carter. *Fed Proc* 33(3):754, 1974.

5606 PHYSICAL AND BIOLOGICAL PROPERTIES OF MuLV (SCRIPPS): VARIATIONS DEPENDENT ON CELLULAR ORIGIN. *(E.)* Puga, A. (Scripps Clin. Res. Found., La Jolla, Calif.), A. B. Jenson, F. C. Jensen, D. E. Kohne and R. A. Lerner. *Fed Proc* 33(3):754, 1974.

5607 TRANSPLANTABLE MAREK'S DISEASE (MD) LYMPHOMA: DEVELOPMENT AND IMMUNLOGICAL CHARACTERIZATION. *(E.)* Theis, G. A. (New York Med. Coll., Valhalla), L. W. Schierman, T. N. Fredrickson and R. A. McBride. *Fed Proc* 33(3):739, 1974.

5608 IMMUNOHISTOLOGIC STUDY OF HUMAN WART-DERIVE CELLS IN TISSUE CULTURE. *(E.)* Niimura, M. (Univ. Minnesota, Minneapolis), R. Wooley and F. Pass. *Fed Proc* 33(3):729, 1974.

5609 PRODUCTION OF LYMPHOKINE-LIKE FACTORS BY SV40-INFECTED CELL CULTURES. *(E.)* Bigazzi P. E. (State Univ. New York, Buffalo), S. Cohen, P. A. Ward and T. Yoshida. *Fed Proc* 33(3):640, 1974.

5610 ELECTRON MICROSCOPIC AND IMMUNOHISTOCHEMICAL LOCALIZATION OF LYMPHOBLASTIC LEUKEMIA VIRUS (JM-V) AND VIRUS-ASSOCIATED ANTIGEN. *(E.)* Kim, S. N. (Dep. Pathobiol., Univ. Connecticut, Storrs), J. W. Yoon and A. J. Kenyon. *Fed Proc* 33(3):637, 1974.

5611 APPEARANCE OF NEW ANTIGEN(S) ON MICE LYMPHOCYTES AFTER INJECTIONS OF RAT CELLS INFECTED WITH INCOMPLETE LCM VIRUS. *(E.)* Sharon, N. (Dep. Pathol., Evanston Hosp., Ill.). *Fed Proc* 33(3):637, 1974.

5612 ULTRASTRUCTURAL COMPARISON BETWEEN CRITICAL POINT DRIED TYPE B AND TYPE C ONCORNAVIRUS PARTICLES. *(E.)* Beju, D. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.), T. A. Calvelli and E. de Harven. *Fed Proc* 33(3):754, 1974.

5613 STUDIES OF LYMPHOID TISSUES FROM GUINEA PIGS EXPERIMENTALLY INFECTED WITH HERPES AND/OR C-TYPE VIRUSES. *(E.)* McTighe, A. (Yale Univ. Sch. Med., New Haven, Conn.) and G. D. Hsiung. *Fed Proc* 33(3):739, 1974.

5614 SPLEEN AND TUMOR CELL INTERACTION IN MURINE MYELOMA. *(E.)* Warner, T. F. (Mayo Med. Sch., Rochester, Minn.) and R. G. Krueger. *Fed Proc* 33(3):616, 1974.

5615 EPSTEIN-BARR VIRUS (EBV): EXPERIMENTAL INFECTION AND LYMPHOMA INDUCTION IN MARMOSET MONKEYS. *(E.)* Falk, L. A. (Rush-Presbyt.-St. Luke's Med. Cent., Chicago, Ill.), L. G. Wolfe and F. Deinhardt. *Fed Proc* 33(3):739, 1974.

5616 RESPONSE OF EMBRYOS TO THE LYMPHOMATOUS HERPESVIRUS OF MAREK'S DISEASE. *(E.)* Longenecker, B. M. (Dep. Immunol., Univ. Alberta, Edmonton, Canada), F. Pazderka, H. Stone and R. F. Ruth. *Fed Proc* 33(3):739, 1974.

See also:

* (Rev): 5401, 5406, 5407, 5408, 5409, 5412, 5419, 5420, 5422, 5424, 5426, 5434, 5435, 5436, 5437, 5438
* (Phys): 5516, 5526
* (Immun): 5618, 5621, 5622, 5624, 5632, 5634, 5635, 5637, 5639, 5640, 5654, 5655, 5663, 5666, 5667, 5669, 5670, 5671, 5672, 5675, 5678, 5685, 5686, 5689, 5694, 5703, 5706, 5707, 5708, 5709, 5710, 5713, 5720, 5721, 5726, 5735
* (Epid-Biom): 5826

5617 IMMUNE LYMPHOCYTE COMPETENCE IN UROLOGIC CANCER: PLASMA INHIBITION OF LYMPHOCYTE TRANSFORMATION.

(E.) McLaughlin, A. P., III (San Diego Sch. Med., La Jolla, Calif.), W. O. Kessler, K. Triman and R. F. Gittes. *Surg Forum* 24:112-113, 1974.

Phytohemagglutinin (PHA)-stimulated lypmphocyte transformation in urologic cancer patients was measured using a quantitative *in vitro* measurement of immunologic competence. The final cell concentration of the cultures was adjusted to 7.5×10^5 lymphocytes/ml and included PHA (3 mg/ml). A significant decrease in lymphocyte reactivity in patients with urologic cancer was found. The mean activity for 82 cancer patients differed significantly from 63 control subjects. The decreased lymphocyte activwas restored to normal when cancer lymphocytes were cultured in homologous control plasma. Lymphocytes from control subjects showed low *in vitro* reactivity when cultured in homologous plasma from cancer patients. The lymphocyte inhibitory effect of plasma from the cancer patients was specific and not due merely to the presence of homologous plasma. Therefore, the depression of lymphocyte reactivity in patients with urologic cancer was not due to an intrinsic cellular abnormality. It appeared to result from a lymphocyte-inhibiting factor in plasma of cancer patients. The identification of this factor in the plasma may be able to open new avenues in urologic cancer for immunotherapy.

5618 AUTOGENOUS IMMUNITY TO ENDOGENOUS RNA TUMOR VIRUS: DIFFERENTIAL REACTIVITIES OF IMMUNOGLOBULINS M AND G TO VIRUS ENVELOPE ANTIGENS.

(E.) Lee, J. C. (Carcinog. Prog., Oak Ridge Natl. Lab., Tenn.), M. G. Hanna, Jr., J. N. Ihle and S. A. Aaronson. *J Virol* 14(4):773-781, 1974.

The autogenous humoral immune response of male B63F$_1$ mice (aged 11 wk to 30 months) to their endogenous leukemia virus was examined in terms of the reactivities of individual classes of antibody present in normal B6C3F$_1$ serum. Whole serum and the immunoglobulin (Ig) M and G fractions of serum from animals of different age groups were compared by radioimmune precipitation assays and viral infectivity neutralization assays. Both IgM and IgG fractions were able to precipitate serum, although not as effectively as whole serum. Virus-specific antibody levels, as well as total antibody concentrations in whole serum, appeared to increase with age. Sodium dodecyl sulfate gel electrophoresis analysis was performed with immune precipitates obtained when whole serum or 19 or 7*S* fractions were reacted with disrupted virus. The 19*S* antibody fraction reacted with three antigenic determinants on the viral envelope; these antigens have apparent molecular wt of 17,000, 43,000, and 68,000. The last two appear to be glycoproteins and may correspond to the M$_2$ and M$_1$ antigens. The 7*S* component reacted only with the 17,000-molecular-wt protein. Neutralization assays against BALB:virus 2, a xenotropic endogenous mouse type-C virus, showed that 19*S* fractions and whole serum, but not the 7*S* fraction, possessed neutralizing activity. These findings demonstrate that IgM and IgG antibodies in normal B6C3F$_1$ serum have differential reactivities with respect to both recognition of viral envelope antigens and neutralization of endogenous murine leukemia virus. The results are consistent with the hypothesis that the autogenous humoral immune response is a systemic host function that may be important in the regulation of endogenous type-C virus expression *in vivo*.

5619 IMMUNOLOGIC ABNORMALITIES IN HEAD AND NECK CANCER.

(E.) Eilber, F. R. (U. California Sch. Med., Los Angeles), D. L. Morton and A. S. Ketcham. *Am J Surg* 128(4):534-538, 1974.

A battery of skin tests and the 2,4 dinitrochlorobenzene (DNCB) sensitivity test were given to 120 18-80-yr-old patients with primary malignant neoplasms o the head and neck and to 40 age-matched controls with benign tumors of the head and neck to determine their systemic immunologic reactivity. None of the patients had surgery, radiation, chemotherapy or steroids during the 6-wk period prior to the study. Of the 86 patients with localized and operable neoplasms, 64 percent were DNCB-positive; the incidence of DNCB reactivity in this group was significantly less than in the controls (95% DNCB-positive). Of the 34 patients with locally advanced or disseminated disease, 85 percent were nonreactive to DNCB; the immunologic reactivity of this group was significantly less than that of patients with nonlocalized growths and of the controls. The operable and inoperable patients did not differ in their reactivity to the skin test battery, nor did either group differ significantly from the controls. After six months and one yr, more than 80% of the DNCB-positive patients remained free of recurrent disease, while 90% of the non-reactive patients developed recurrent disease within one year. Postoperative DNCB tests of 16 patients every two months showed that persistence of positive reactions or conversion from negative to positive was associated with control of tumor growth whereas persistence of nonreactivity or a change from positive to negative reactivity was associated with tumor recurrence. Thus, systemic immunity is another important factor in neoplasms usually thought of as regional and localized.

5620 THE IMMUNE REACTION AGAINST MALIGNANT MELANOMA STUDIED IN BIOPSY MATERIAL.

(E.) Karesen, R. (Norwegian Def. Microbiol. Lab., Oslo). *Acta Pathol Microbiol Scand* [*A*] 82(1):116-126, 1974.

Biopsies from primary and secondary malignant melanomas were studied by light microscopy as well as by fluorescence and electron microscopy. Tumor sections were incubated with fluorescein-conjugated antihuman γ-globulin serum. In the two primary tumors, lymphocytes in different stages of transformation were observed at the periphery of the tumor, but no evidence of a cytotoxic effect of immune cells against tumor cells was obtained. Plasma cells were few and accumulation of γ-globulins was not observed outside these cells. In 13/15 metastatic tumors, lymphocytes and plasma cells were observed among the tumor cells, plasma cells being the most prevalent cell type. In 11 cases, γ-globulins were found on the surface of tumor cells and in seven cases a variable proportion of the cells showed specific cytoplasmic fluorescence. Ultrastructural changes indicative of a cytolytic process were observed in a metastatic tumor that showed the most extensive cytoplasmic fluorescence. Virus-like particles could not be detected in any tumor tissue.

621 ANTIBODY RESPONSE OF TWO INBRED LINES TO RAV-0 AND RAV-1.

(E.) Motta, J. V. (Anial Physiol. Genetics Inst., U.S. Dept. Agr., Beltsrille, Md.) and L. B. Crittenden. *Poultry Sci* 3(5):1958-1959, 1974.

mbryos from line 100, a spontaneous producer of ous-associated virus-0 (RAV-0), and line 15, which s free of spontaneous RAV-0 production, were inocuated with RAV-1 and/or RAV-0. Only one of 39 line 00 birds was antibody positive to RAV-0 at 16 wk nd none produced antibody against RAV-1. Antibody roduction to RAV-0 occurred in 2 of 17 line 15 birds, one producing antibody to RAV-1. Seventeen of 19 ine 15 birds inoculated with RAV-0 produced antiody against RAV-0 and none produced antibody to AV-1. Eight of 12 line 15 birds inoculated with AV-1 produced antibody against RAV-1 and three of 2 produced antibody against RAV-0. Seven of 12 line 5 birds inoculated with RAV-0 and RAV-1 produced ntibody to RAV-1, and two of 12 produced antibody o RAV-0. Following inoculating with RAV-0 and/or AV-1, few line 100 birds produced antibody to either, ndicating that this line was naturally tolerant to he endogenous RAV-0 and was made tolerant to the xogenous RAV-1, or was a poor antibody producer. here was some evidence of contact transmission of AV-0.

22 THE IMMUNE RESPONSE TO VIRALLY DETERMINED TUMOR ASSOCIATED ANTIGENS.

(E.) Lamon, W. (Dep. Tumor Biol., Karolinska Inst., Stocklm, Sweden). *Biochem Biophys Acta* 355(2):149-176, 74.

rrent concepts of the immune response to both DNA d RNA virally determined tumor associated antigens DTAs) are reviewed, the major emphasis being deted to the immune response to primary viral turs, particularly the murine sarcoma virus (MSV). terms of the specific immune response to VDTAs, ere is evidence that a genetic capability to reond to the antigens plays a role in resistance to ral oncogenesis as does the thymus. It is not own whether VDTAs are thymus dependent or indepennt. In addition, there are many examples of imnologic hyporesponsiveness to VDTAs which may inlve both specific and nonspecific components. th regard to the effector phase of immune responveness to VDTAs, specific effector cells are genated in response to VDTAs; however, the relative fector roles played by the B and T cells *in vivo* main to be determined. The humoral antibody reonse to VDTAs on the cell surface are important *vivo* factors in tumor regression, and complement an important factor in the *in vivo* destruction virally induced tumor cells. Antibody-dependent lymphocyte toxicity is one of the mechanisms of action of immune B cells *in vitro*, but the *in vivo* significance of this mechanism is undefined. Further knowledge concerning the immune response to VDTAs *in vivo* will hopefully eventually provide the understanding necessary for effective immunotherapy in man.

5623 THE INFLUENCE OF A GRAFT-*VERSUS*-HOST REACTION ON THE INCIDENCE OF METASTASES AFTER TUMOR TRANSPLANTATION.

(E.) Carnaud, C. (Dep. Cell Biol., Weizmann Inst. Sci., Rehovot, Israel), O. Markowicz and N. Trainin. *Cell Immunol* 14(1):87-97, 1974.

The influence of the graft-versus-host (GVH) reaction on the development of primary Lewis lung carcinoma (3LL) and the extent of metastatic spread was studied in (C3H x C57BL/6)F_1 mice injected with parental lymphoid cells and inoculated at the same time with 3LL tumor (GVH reaction increases host resistance against 3LL tumor growth). Mice with a GVH reaction had an average of 0.8 and 1.3 metastases in in two experiments, while control mice had an average of 13.7 and 5.6 metastases in the experiments. A reduction in weight of the primary tumor was observed in mice with GVH reaction. C3H or C57BL parental spleen cells injected into F_1 mice resulted in a significant decrease in the average number of lung metastases found in both groups in addition to the GVH reactions. GVH reaction and its resistance to the 3LL tumor were temporary; no protection was observed in mice inoculated with tumor three weeks after the last spleen cell transfer. GVH reaction induced only a transient and partial impairment of T-lymphocyte function. Lymphoid cells from 3LL tumor-bearing mice accelerated the growth of the same tumor in comparison to unsensitized cells; sensitized lymphoid cells from tumor-bearing mice undergoing a GVH reaction lacked the capacity to enhance 3LL tumor growth. It is suggested that subclasses of T-cells with antagonistic functions participate in the regulatory mechanisms of tumor growth control.

5624 DIFFERENTIAL EFFECTS OF TWO STRAINS OF BCG ON TRANSPLANTATION IMMUNITY TO SV40-INDUCED TUMORS IN HAMSTERS.

(E.) Fortner, G. W. (Carcinog. Program, Oak Ridge Natl. Lab., Tenn.), M. G. Hanna, Jr. and J. H. Coggin. *Proc Soc Exp Biol Med* 147(1): 62-67, 1974.

A transplantable hamster-SV40-tumor system was used in studying the protection or enhancement of treatment with two strains of *Mycobacterium bovis* (BCG). Phipps BCG strain obtained peak growth in two weeks on solid media, whereas the Glaxo BCG strain required three weeks for maximum growth. Immunization of LVG/LAK male Syrian hamsters with Phipps strain delayed tumor appearance although final tumor incidence was 13% lower than controls. In combination with irradiated tumor cells, Phipps strain had a synergistic effect on transplantation immunity, resulting in a significant protection against tumor challenge. Immunization with the Glaxo strain resulted in significant enhancement of tumor incidence. Both BCG strains grew well in hamsters with evidence of granulomas in the draining lymph nodes; at 26 weeks the BCG infection was pronounced in the Phipps groups but not yet macroscopically visible in the Glaxo group. Attempts at immunotherapy by BCG injection were generally ineffective. BCG showed protective effects, as measured by delay of appearance and reduction of tumor incidence with the Phipps strain, and actual enhancement of tumor incidence with the Glaxo strain.

5625 IMMUNE RESPONSE TO A TRANSPLANTABLE INTRACEREBRAL GLIOMA IN RATS. *(E.)* Blume, M. R. (Dep. Neurol. Surg., Univ. California, San Francisco), C. B. Wilson and D. A. Vasquez. *Recent Prog Neurol Surg, Proc Symp Int Congr Neurol Surg, 5th, Tokyo, Oct 7-13, 1973 (Amsterdam Excerpta Medica)* 129-132, 1974.

Immune response to intracerebral and subcutaneous challenge with a chemically induced, transplantable glioma was studied in a male CD Fisher rat by weekly, intravenous injections of N-nitrosomethyl urea. X-irradiated tumor cells which had received a radiation dose just sufficient to prevent tumor growth resulting from the immunizing inoculum were chosen as the immunogen. Immunization was accomplished by injecting 150 g male Fisher-344 rats with 0.1 ml of x-irradiated tumor cells on days 29, 21, 14, 11, 7, and 4 prior to challenge. After the initial subcutaneous injection in the flank, all other injections were given i.p. The number of tumor cells was only two to four fold greater than the minimal dose required to produce tumor growth in 100% of non-immune animals as determined by earlier experiments. During the challenge, 1,000 cells were inoculated intracerebrally and 5,000 cells were inoculated subcutaneously in the flank. Animals immunized with x-irradiated tumor cells resisted challenge while in all the controls there occurred growth of tumor nodules greater than 1 cm diameter by day 37 of the subcutaneous challenge and death by day 43 (mean survival: 39 days) in the intracerebral challenge. Although two out of 18 of the immunized animals succumbed to brain tumors on days 48 and 49, the remaining immunized animals were alive and well 60 days post-intracerebral challenge.

5626 IMMUNE RESPONSE TO A TRANSPLANTABLE MALIGNANT MELANOMA IN MICE. *(E.)* Bartholomaeus, W. N. (Perth Med. Cent., Australia), A. E. Bray, J. M. Papadimitriou and D. Keast. *J Natl Cancer Inst* 53(4):1065-1072, 1974.

Humoral immune response to the murine B16 melanoma was studied in syngeneic C57BL/6J hosts inoculated s.c. with 1 x 10^5 viable tumor cells. The tumor modified host cellular immune function, as determined by lymphocyte response to phytohemagglutinin (PHA). Blood, spleen, and regional-node lymphocytes had a decreased response to PHA by day 21 of tumor growth. The development of serum antibody against B16 tumor was assessed from activity in complement fixation, 74-hr passive cutaneous anaphylaxis in homologous skin, cytotoxicity for B16 cells *in vitro* and ability to inhibit lymphocyte-mediated toxicity for B16 target cells. Complement-fixing, cytotoxic and reaginic antibodies to B16 reached maximum levels by day 12, 18, and 9, resp. Spleen lymphocytes from tumor-bearing animals significantly inhibited B16 growth *in vitro*, whereas lymphocytes from the regional nodes of tumor-bearing animals stimulated growth. The cytotoxic activity of spleen lymphocytes from tumor-bearing mice was abolished by serum from tumor-bearing animals; with serum, spleen lymphocytes stimulated target cell growth by up to 29%. Tumor macrophage content in C57BL/6H mice increased with time after implantation. Histologic examination of the growing tumor revealed an early, transient, lymphocyte infiltrate and later macrophage involvement. It is concluded that the absence of cytotoxic lymphocytes in regional nodes, a serum factor capable of blocking lymphocyte-mediated toxicity, and suppression of T-cell function preclude an effective immune response by C57BL/6J mice to the B16 melanoma.

5627 TUMOUR METASTASIS IN MICE WITH REDUCED IMMUNE REACTIVITY. II. STUDIES WITH A HIGHLY ANTIGENIC MCA-INDUCED SARCOMA IN THYMECTOMIZED AND/OR SUB-LETHALLY IRRADIATED C57BL/6J MICE. *(E.)* Suurküla, M. (Dep. Pathol., Univ. Gotëborg, Sweden) and B. Boeryd. *Int J Cancer* 14(5):633-641, 1974.

Spontaneous metastasis formation of the MCA-induced sarcoma, MCG101, was studied in thymectomized and/or sublethally irradiated male and female C57BL/6J mice. The extent of immunosuppression and immune system recovery was determined at monthly intervals after irradiation. Thymectomy of adult mice was performed 1-3 weeks before irradiation (whole body dose was 560 r). Humoral antibody response to sheep RBC was determined in separate experimental groups. Cellular immunity was measured by survival of allogeneic A/Sn skin grafts. The immune reactivity of irradiated (IRR; sham-thymectomized and irradiated) and thymectomized plus irradiated (TX-IRR) groups against MCG101 was determined by s.c. and i.v. transplantation in the mouse tail. Immunization was performed one and one-half months after irradiation. The tail tumor was resected on the 15th day and challenge occurred ten days after resection. Tumor growth was measured by weighing a fixed tail length. Pulmonary metastases incidence was measured microscopically using sectioned lung. TX-IRR and IRR group humoral antibody response against sheep RBC was suppressed, with TX-IRR recovery slower than that of IRR. Thymectomized (TX) humoral response did not deviate from controls. Cellular antibody response by skin grafting revealed no prolonged rejection time in any group. Immunity against MCG101 was reduced in TX-IRR immunized mice in s.c. and i.v. administration groups. Immunity against i.v. administration of tumor cells was more pronounced in TX-IRR than in IRR immunized mice. Tumor growth was greater in female than male mice in all groups. TX-IRR groups displayed smaller tumors than IRR groups in both sexes. Metastasis incidence showed no difference with sex. Metastasis incidence in TX-IRR groups was significantly higher, while TX and IRR groups did not significantly increase metastasis formation. The results indicate that thymectomization and irradiation facilitate tumor growth; immune systems can facilitate metastasis formation.

3 TUMOUR GROWTH, PHAGOCYTIC ACTIVITY AND ANTIBODY RESPONSE IN *CORYNEBACTERIUM PAR-*
-TREATED MICE. *(E.)* Woodruff, M. F. A. (Dep.
;. Bacteriol., Univ. Edinburgh, Scotland), W. H.
ide and N. Dunbar. *Clin Exp Immunol* 17(3):509-
1974.

antibody response to *Corynebacterium parvum* and
effect on phagocytic activity and tumor growth
r such parameters as its route of injection (i.
r s.c.) and the immunological status of mice
act, T cell-deprived, or pre-immunized) were
ied. A methylcholanthrene-induced, fibrosar-
tumor was transplanted by s.c. inoculation
0^4 viable cells into adult (18-22 g) female CBA/
ce. The dosage of the two strains of *C. parvum*
6134 Batch WEZ 174 and NCTC 10390) was either
or 0.7 mg. Anti-*C. parvum* was assayed and read
agglutination and ability of the pellet to
am. The phagocytic index was based on the rate
learance of i.v. injected colloidal carbon.
e was a relatively high level of antibody to *C.*
um in normal, untreated mice, and a marked rise
itre after a single i.p. injection, which reached
peak in a month. At this time there was an ac-
rated decline in the mice with tumors. In mice
ulated with tumor three days prior to *C. parvum*
e was a smaller degree of antibody response. A
nd injection during peak evoked a secondary re-
se in normal mice. T cell-deprived mice had re-
s similar to normal mice, suggesting that *C. par-*
behaves as a thymus independent antigen. Fail-
of s.c. injection to produce significant re-
ses was observed and it appears to suggest that
reticuloendothelial stimulatory and tumor in-
tory effects actually depend on the presence of
imed state towards the organism. Both the anti-
effect of *C. parvum* and its stimulatory effect
acrophage activity, as judged by the carbon
ance test, can occur in the presence of high
ls of antibody directed against the organism.

PARABIOTIC INHIBITION OF MURINE SARCOMA GROWTH.
(E.) Feraci, R. P. (Natl. Cancer
, Bethesda, Md.) and L. Schour. *Surgery* 75(3):
35, 1974.

d C57Bl/6J female mice were injected i.m. with
of a sarcoma originally induced in a syngeneic
by methylcholanthrene. Tumor-bearing mice
placed in parabiosis with normal mice or with
previously immunized s.c. against the same tu-
After 15 days in parabiosis, tumor volumes in
group were less than half that (4400 mm^2) ob-
d in tumor-bearing controls not undergoing para-
s. When separated from their tumor-bearing
ers and challenged i.m. with sarcoma, normal
showed a decreased tumor incidence (65%) com-
with controls (93%). Nontumor-bearing mice
ated from immune mice showed even lower tumor
ence (25%) following challenge and mice immune
e sarcoma were completely resistant to chal-
. Lymphocyte toxicity studies gave results
leling those of the *in vivo* tumor challenge.
ficant cytotoxicity was seen in all groups and
reatest in the immune animals, followed by nontumor-bearing mice from the parabiotic immune group and nontumor-bearing mice from the parabiotic normal group, resp. It is concluded that parabiotic inhibition of tumor growth is an immunologic phenomenon.

5630 DEVELOPMENTAL PROCESS OF PALSMACYTOMA IN BALB/c MICE: IMMUNE RESPONSE AND ONSET OF TUMOR.

(E.) Migita, S. (Cancer Res. Inst., Kanazawa Univ., Japan) and S. Natsu-ume. *Gann Monagr Cancer Res* (16):15-25, 1974.

The relationship of immune response and plasmacytoma onset was studied in BALB/c mice receiving 1 mg of Taka-amylase-A (TAA) and Freund's complete adjuvant (FCA) three times at two month intervals. Humoral response measured by immunoelimination showed a normal distribution of antibody production and a subsequent incidence of plasmacytoma after primary immunization. Following second immunization antibody production displayed a double-peak curve, with plasmacytoma incidence for eight months thereafter being 45% (12/27) in mice with a high immunological response and 15% (6/41) in mice with a lower response. Low immunoelimination followed plasmacytoma development. ^{3}H-thymidine incorporation showed a decrease in cellular immunity with age, with a maximum response at age 3-5 months. Migration-inhibition factor (MIF) to TAA measurements showed a decrease in production with age, hence a decrease in specific immunity. Using delayed hypersensitivity to picryl chloride designed to follow cellular immunity changes until the onset of plasmocytoma, a decreased response with age and with the number of injections was shown. Humoral and cellular response (immunoelimination and delayed hypersensitivity) was shown to be inversely related with a -0.615 correlation coefficient. The total incidence of plasmacytoma development in mice was found to be 28%. The remaining immunized mice were found to be universal acceptors of transplanted tumors. The results show that plasmacytoma incidence is age-influenced and suggests that if TAA and FCA injections stimulate humoral immunity a tendency towards a higher plasmacytoma incidence exists. If the TAA and FCA injection stimulates cellular immunity a lower incidence may be possible. The results also imply that the decrease in cellular immunity is not sufficient for plasmacytoma onset.

5631 SUPPRESSION OF MOUSE EPENDYMOMA GROWTH AFTER IMMUNIZATION WITH TUMOR RIBOSOMAL COMPLEXES.

(E.) Lo, J. S. (Sunnybrook Med. Cent., Univ. Toronto, Canada) and J. A. Kellen. *Oncology* 30(6):467-474, 1974.

In order to determine whether tumor ribosomes induce a specific immune response against a subsequent tumor transplantation, mice of the inbred C57Bl/6J strain were used. Implantation of a preweighed tumor slice into the subcutis of the abdomen and injection of cell suspensions into the subcutis were the two methods of tumor transplant that were used. Results showed that immunization with ribosomal complexes, which were prepared from experimental ependymomas transplanted in the mice, decreased tumor growth significantly. Survival of the hosts transplanted with the ependymomas was also increased. The calculated tumor growth rate in the immunized mice was significantly slower than in control mice at the third and fourth week. The actual tumor size, as measured by wet weight, was also significantly smaller. A possible explanation for the immunoprophylactic effect is that the ribosomal complex can induce in the tumor host a nonspecific anti-RNA response. Such responses may cause conformational changes of the ribosomes that block the binding of mRNA and/or tRNA. This leads to retardation of the protein synthesis and of tumor growth.

5632 CELLULAR IMMUNE RESPONSE TO VIRUS-SPECIFIC ANTIGEN IN HAMSTERS BEARING ISOGRAFTS OF CYTOMEGALOVIRUS-TRANSFORMED CELLS. *(E.)* Murasko, D. M. (Milton S. Hershey Med. Cent., Pennsylvania State Univ., Hershey) and R. N. Lausch. *Int J Cancer* 14(4):451-460, 1974.

The immune response of inbred LSH hamsters to syngeneic transplants of hamster embryo fibroblasts (HEF) transformed by cytomegalovirus (CMV) was investigated. Using the microcytotoxicity assay, the spleen cells from tumor-bearing hosts consistently killed both homologous tumor cells and CMV-infected human embryonic lung (HEL) cells. No significant cytotoxicity was observed when uninfected HEL, normal HEF, or HEF transformed by herpes simplex virus type 1 (HSV-1) or PARA-(defective SV40)-adenovirus 7 (PARA-7) served as the target cells. Spleen cells from animals bearing isografts of HSV-1 and PARA-7-transformed cells were cytotoxic for their respective tumor cells but not for CMV-transformed cells. Further studies showed that spleen cells from hamsters immunized with CMV or CMV-infected HEL were specifically cytotoxic for CMV-transformed hamster cells. No antibody cytotoxic for CMV-transformed cells was detected in the sera of CMV or CMV-infected HEL-immunized hosts, or in sera from tumor-bearing animals. The results corroborate previous serological data indicating that hamster cells transformed by CMV express virus-related membrane antigen(s) and demonstrate that such antigen(s) can induce a cell-mediated immune response in the tumor-bearing host.

5633 IMMUNOGENICITY, ANTIGENICITY AND MECHANISMS OF TUMOR REJECTION OF MINERAL-OIL-INDUCED PLASMACYTOMAS IN SYNGENEIC BALB/c MICE. *(E.)* McCoy, J. L. (Litton Bionetics, Inc., Kensington, Md.), J. H. Dean, L. W. Law, J. Williams, N. T. McCoy and B. J. Holiman. *Int J Cancer* 14(2):264-276, 1974.

Transplantation immunity studies were conducted to determine whether mineral-oil-induced plasmacytomas of syngeneic BALB/c mice possess tumor associated transplantation antigens. It was established that the optimum immunization regimen against transplantation antigens was obtained by immunizing syngeneic hosts with an intradermal inoculation of viable plasmacytoma cells, followed by therapeutic drug-induced tumor regression with aniline mustard. This immunization regimen induced transplantation immunity not only to the homologous tumor employed for immunization, but was effective in demonstrating some cross protection when mice were rechallenged with other plasmacytomas. Thus, definite cross reactivity of antigens was observed between some plasmacytomas; others, shown to possess transplantation antigens, did not share antigens. Studies with Winn assays employing cells from BALB/c mice immune to plasmacytoma cells, support the idea that cell mediated immune functions are responsible for syngeneic plasmacytoma rejection. Specificity studies in subsequent Winn assays demonstrated that the kill was directed against plasmacytoma cells and not against transplantation antigens of an MLV-induced Moloney leukemia and SV40 virus-induced tumor cells. The nature of the transplantation antigens detected is not known, but they probably represent new cell-associated antigens acquired during malignant transformation. The selective removal of the thymus-dependent cell component of the immune lymphocyte population with anti-theta serum and complement eliminated the tumor neutralizing properties of the immune cells in the Winn assay. The data demonstrate that rejection of plasmacytoma cells by the syngeneic host appear to be specifically directed against transplantation antigens and seem to be a function of cell mediated immunity.

5634 CELL-MEDIATED IMMUNITY TO EPSTEIN-BARR VIRU AND A BLOCKING FACTOR IN PATIENTS WITH INFECTIOUS MONONUCLEOSIS. *(E.)* Lai, P. K. (Dep. Micr biol., Univ. Western Australia, Perth), E. M. Mackay-Scollay, P. J. Fimmel, M. P. Alpers and D. Keast. *Nature* 252(5483):608-609, 1974.

Cell-mediated immunity to Epstein-Barr virus and the presence of a blocking factor which can abrogate leukocyte migration inhibition were investigated in patients with infectious mononucleosis. Serum antibody to Epstein-Barr virus-capsid antigen in normal adults and in patients with infectious mononucleosis was measured by indirect immunofluorescence. In leukocyte migration inhibition studies, cell-mediated immunity to Epstein-Barr virus was not detected in circulating leukocytes in the acute phase of infectious mononucleosis but was found in circulating leukocytes of normal adults who had antibody to Epstein-Barr virus and patients convalescent from infectious mononucleosis. In addition, a blocking factor specific to Epstein-Barr virus was found in the acute and convalescent sera of these patients. It was not determined whether the blocking factor is part of normal negative feedback mechanisms involved in the immunity to virus infections, or whether it has an important role in the differential pathogenesis of diseases caused by Epstein-Barr virus. It is not related to the Epstein-Barr virus-capsid antibody nor the Paul-Bunnell heterophil antibodies since it is absent in normal sera with a high level of Epstein-Barr virus-capsid antibody and present in convalescent sera with no Paul-Bunnell heterophil antibodies. The absence of cell-mediated immunity to Epstein-Barr virus in circulating leukocytes in the acute phase of the disease does not rule out the possibility that leukocytes mediating cell-mediated immunity to Epstein-Barr virus are active outside the circulation. The development of cell mediated immunity

Epstein-Barr virus at the convalescent phase, how-
er, suggests that a transient impairment of the
ll-mediated immunity function might have occurred.

35 TUMOR INDUCTION BY IMMUNOLOGICALLY ACTIV-
ATED MURINE LEUKEMIA VIRUS: CELLULAR IM-
NITY EARLY IN THE GRAFT-*VS*-HOST REACTION.

(E.)
ddle, N. H. (Yale Univ. Sch. Med., New Haven,
nn.), M. Y. K. Armstrong and F. F. Richards. *J
munol* 112(2):706-715, 1974.

e cellular immune response was examined *in vivo*
l *in vitro* in normal (BALB/c x A)F_1 (CAF_1) under-
ing a BALB/c-induced graft-versus-host reaction
VHR) to test the hypothesis that immunosuppression
the GVHR could account for tumor development.
e responsiveness of CAF_1 mice with induced GVHR
a spectrum of skin grafts that delineate H_2 and
a-H_2 histocompatibility antigens, hypersensitiv-
y to tuberculin challenge (ear swelling evaluation)
acceptance of two plasmacytoma tumors was eval-
ed. GVHR was induced by four weekly i.p. injec-
ns of spleen cells from BALB/c mice and respon-
eness was compared to untreated controls. Skin
ft survival from C57Bl/6 mice was slightly pro-
ged in GVHR hosts and showed a slightly quicker
ponse to tuberculin challenge. GVHR hosts ac-
ted plasmacytoma tumor transplants more readily
n controls especially where the GVHR had been
ablished for nine months prior to transplanta-
n. Lymphocyte cytotoxicity tests were conducted
ng cells from normal or GVHR mice that had been
n-grafted or challenged with tuberculin and
Bl/6 fibroblast target cells. The similarity in
ponse to these two types of tests between normal
GVHR lymphocytes suggests that the GVH reaction
s not cause suppression of cell-mediated immunity.

6 CELLULAR BASIS OF IMMUNODEPRESSION IN MICE WITH PLASMACYTOMAS.

(E.) Zolla, S. (New
x Univ. Med. Sch., N. Y.), D. Naor and P. Tana-
chaiyapong. *J Immunol* 112(6):2068-2076, 1974.

cell(s) and mechanism(s) involved in the reduced
acity of plasmacytoma (PC)-bearing mice to synthe-
e IgM antibodies to new antigens were studied. Fe-
e BALB/c and DBA/2 mice bearing s.c. plasmacytomas,
mented melanomas and thymic lymphomas were immun-
l with sheep red blood cells (SRC) and their pri-
y immune responses were assayed. The primary im-
e responses to SRC in the PC-bearing animals were
sistently depressed, the degree being dependent on
tumor size and dosage of antigen administered.
e bearing the two PC which most severely depressed
primary response (TEPC-183 and SPOC-11) also showed
mpaired ability to mount a secondary response to
The primary response of the PC-bearing mice to
ymus-dependent mouse antigen was also depressed,
cating that B cells were at least one of the cell
lations adversely affected in the tumor-bearing
s. B-cell precursors of antibody-forming cells,
gen-binding cells, were found in normal quantities
appeared to be capable of binding antigen. In
tion, the PC which caused the most severe immuno-
ession affected the maturation of the precursors
of antibody-forming cells, while those tumors which had a significantly less marked effect on antibody production (NP-2m and MPC-11) did not appear to alter the process of differentiation in the antigen-triggered cells. Mice bearing the RL 1 thymic lymphoma and the S91 melanoma showed no significant change in their primary immune response to SRC. Although the mechanism by which PC influences the response of normal lymphoid cells to antigen challenge remains to be elucidated, the phenomenon of PC-induced immunodepression suggests a model system for determining whether proliferating B cells play a regulatory role in immune processes.

5637 SUPPRESSIVE EFFECT OF LEUKEMIA VIRUS-INFECTED LYMPHOID CELLS ON *IN VITRO* IMMUNIZATION OF NORMAL SPLENOCYTES.

(E.) Kateley, J. R. (Albert Einstein Med. Cent., Philadelphia, Pa.), I. Kamo, G. Kaplan and H. Friedman. *J Natl Cancer Inst* 53(5):1371-1378, 1974.

Spleen cells from Friend leukemia virus (FLV)-infected BALB/c and C57BL/6 mice were immunized *in vitro* with sheep RBC and tested for antibody plaque-forming cells (PFC) by the hemolysin-in-gel assay. The PFC response of spleen cells from BALB/c mice infected 3 days *in vivo* before *in vitro* culture and immunization was approximately two-thirds lower than that of control spleen cells exposed to sheep RBC. No marked immunodepression was noted *in vitro* with spleen cells from FLV-infected C57BL/6 mice. Addition of spleen cells from FLV-infected donor BALB/c mice to normal syngeneic spleen cell cultures markedly diminished the PFC response after sheep RBC immunization *in vitro*. As few as 10^5 splenocytes from 7- to 28-day FLV-infected mice suppressed the expected number of PFC on the 5th day of culture by 50-80%. Leukemic spleen cells were immunosuppressive when added to normal spleen cells either at culture initiation or 3 days later. However, immunosupression was even greater when infected spleen cells were mixed with normal spleen cells 2 days before addition of sheep RBC. Although bone marrow and thymus cells from FLV-infected mice also decreased the number of PFC induced by sheep RBC, these cell types were less suppressive than splenocytes. Immunosuppression also occurred when infected splenocytes were separated from normal spleen cells by 0.45-μ cell-impermeable membrane filters, but not by dialysis membranes. The leukemic cell factor(s) which mediated immunosupression was either freshly shed virus or a virus-associated factor, since isologous antivirus serum prevented immunosupression *in vitro*. Cell-free FLV homogenates, though markedly leukemogenic and immunosuppressive *in vivo*, did not significantly affect the *in vitro* immune response of spleen cells from normal BALB/c mice. It is concluded that leukemia virus affects antibody-precursor stem cells rather than antibody-producing cells *per se*.

5638 MECHANISM FOR IMMUNOSUPPRESSION IN TUMOR-BEARING HOST.

(E.) Ono, Y. (Tohoku Univ. Sch. Med., Japan), I. Kamo and N. Ishida. *Gann Monogr Cancer Res* (16):37-44, 1974.

Reduction of the immune response in tumor-bearing animals has been noted; a possible explanation of the suppressed immune response through the depletion of macrophages was tested using C3H/He mice. The mice were irradiated and received an injection of sheep red blood cells to prime the macrophages; spleen cell suspensions were made and transferred into normal mice at various doses. The donor mice were either normal or tumor-bearing. Plaque-forming cell (PLC) response was measured four days later. The macrophage function was seen to be suppressed in tumor-bearing mice. Antigen information was transferable to B and T cells in recipient spleen from 5 x 10^6 or 1 x 10^7 spleen cells from normal mice. In experiments to see if late events in immune response were suppressed in tumor-bearing mice, it was found that normal B cells which had already been committed to produce antibody were able to continue proliferation and antibody production in the tumor-bearing condition. The antigen information was not transferable to B and T cells by the antigen-primed macrophages. The steps prior to antigen processing by macrophages were shown to be suppressed in the tumor-bearing mice. The data show that B cell levels are not depleted in tumor-bearing mice and that enough T cells were present to allow response to antigen stimulation. It suggested that the nature of the suppression requires further investigation.

5639 POSSIBLE ROLES OF IMMUNE RESPONSE DURING THE COURSE OF LEUKEMOGENESIS BY RAUSCHER VIRUS IN C57BL/6 MICE: KINETICS OF HUMORAL ANTIBODY RESPONSE TO CELL-SURFACE ANTIGENS. *(E.)* Ishimoto, A. (Aichi Cancer Cent. Res. Inst., Nagoya, Japan), Y. Suzuki, T. Yoshida, S. Oota and Y. Ito. *Gann Monogr Cancer Res* (16):117-125, 1974.

Whether Rauscher virus infection can lead to profound alterations in immunological response, and the relationship between leukemic incidence and the alteration of the immune reaction were studied. When C57BL/6 mice (1-3 months) were inoculated with 1 ml s.c. of crude homogenate of enlarged spleen from Rauscher virus-infected BALB/c mice (three times every 30 days), the subsequent antibody titering showed titers 1-2 grades higher than that of normal antibody in C57BL/6 mice of the same age. Analysis of sera, beginning at three months and continuing up until death, from C57BL/6 mice neonatally inoculated with 0.1 ml of Rauscher virus showed four types of antibody fluctuation patterns: runt and leukemia, leukemia, normal and immunized. All sera from neonatally infected mice contained Gross and Friend-Moloney-Rauscher antigens. Neonatally injected mice antibody titers were in general lower than natural antibody titers; leukemia frequently developed in the lower titer condition. It is suggested that the data support the hypothesis that suppression of immune response is necessary for development of leukemia in C57BL/6 mice.

5640 RELATIONSHIP OF VIRULENT AND ATTENUATED RNA ONCOGENIC VIRUS ANTIGENS TO SURFACE ANTIGENS OF THE VIRUS-TRANSFORMED CELL: IMPLICATIONS FOR THE REVERSE TRANSCRIPTASE SYSTEM, THE PROVIRUS, PROTOVIRUS AND ONCOGENE THEORIES OF NEOPLASIA, AND THE IMMUNOPROPHYLAXIS OF RNA VIRUS-INDUCED TUMORS. *(E.)* Cohen, M. H. (Natl. Cancer Inst., Bethesda, Md.). *J Surg Oncol* 6(5):423-440, 1974.

The association between virus and cell membrane was examined by immunizing with either highly purified Rauscher murine leukemia virus or with Rauscher virus contaminated with cell membranes of the virus-infected cell in *in vitro* tests. Balb/c mice immunized (i.p.) with the membrane-rich vaccine had the expected cytotoxic antibody response to virus-infected malignant spleen cells. When the same sera were tested for antibody activity against purified virus, the antiviral and cytotoxic levels were similar for each serum. A high antiviral antibody titer was obtained in serial monkey antiserums. Attempts to vary the ratio of viral antigen to cell membrane antigen had no effect on the ratio of antiviral antibody to cytotoxic antibody in the resulting antisera. In studies on pooled monkey serum, immunization with purified virus resulted in high antibody titers against the virus; immunization against highly purified virus resulted in an equally high antibody titer against virus-infected malignant cells and in antibody against spleen cells from normal mice. In the second half of the experiments, mice were immunized with live, attenuated Rauscher virus in an attempt to produce immunity to virus antigens but not to malignant cell antigens. Immunization of Balb/c mice with live attenuated virus protected the mice against subsequent challenge with malignant cells. Immunity directed against Rauscher viral antigens is effective in killing or preventing growth of Rauscher malignant cells. Formalinized spleen cell virus immunization seems more effective with Freund's adjuvant than with saline, and immunization with live attenuated virus seems more effective with saline than Freund's adjuvant.

5641 SERUM FACTORS IN MAMMARY NEOPLASIA: ENHANCEMENT AND ANTAGONISM OF SPLEEN CELL ACTIVITY *IN VITRO* DETECTED BY DIFFERENT METHODS OF SERUM FACTOR ASSAY. *(E.)* Blair, P. D. (Dep. Bacteriol. Immunol., Univ. California, Berkeley) and M. A. Lane. *J Immunol* 112(2):439-443, 1974.

Spleen cells from female BALB/c mice bearing progressively growing mammary tumor virus-induced mammary tumors reduced tumor cell survival in microtoxicity tests. Serum from these females contained factor capable of partially or completely inhibiting spleen cell activity, depending on the method of serum assay. When only spleen cells were exposed to serum, blocking was partial and target cell survival, while significantly increased, was still less than in control cells. When only target tumor cells were exposed to serum, complete blocking resulted if serum and target tumor cells were obtained from different donors. In these tests, cell survival was equivalent to that in control cells. If serum and tumor target cells were obtained from the same donor, a significant decrease in lymphocytic activity occurred. Mixing of target cells, serum, and spleen cells at the same time gave results identical to those obtained by pretreatment of the target tumor cells. It is concluded that

nore than one type of mammary tumor cell antigen
(and host response) was detected in these tests.

5642 CHARACTERIZATION OF AN ANTISERUM AGAINST HUMAN MYELOMA CELLS. *(E.)* Staneck, L.
. (Mayo Med. Sch. Clin., Rochester, Minn.), R. G.
reuger and R. A. Kyle. *J Natl Cancer Inst* 53(4):
27-932, 1974.

n antiserum generated with human myeloma cells can
etect antigens on neoplastic tissue culture-adapted
nd on *in vivo* human plasma cells. Malignant plasma
ells were isolated from a patient with IgG-λ-chain
yeloma and maintained in tissue culture (RPMI 8226).
ew Zealand White rabbits were immunized with washed,
ntact RPMI cells in complete Freund adjuvant. The
ntimyeloma cell serum prepared in the rabbits did
ot react with human serum proteins or immunoglobu-
ins (IgG-, IgM-, IgA-, or λ-chains) by immunodif-
usion, complement fixation, or passive hemagglutin-
tion. Immunofluorescence blocking assays showed
at the antiserum was detecting antigens on RPMI
ells other than the immunoglobulin markers. Im-
nofluorescent reactivity was not significantly
educed by absorption with normal bone marrow but
s reduced by absorption with RPMI cells. A strong
munofluorescent reaction was observed with a sub-
pulation of plasma cells, but not with lymphocytes
polymorphonuclear leukocytes, in the bone marrow
patients with multiple myeloma (three IgG-, three
A-, one IgA-λ, and one IgD-λ) or Waldenstrom's
croglobulinemia. These data are suggestive of
me type of specific cell antigen.

43 COMPLEMENT RECEPTORS IN HUMAN LYMPHOBLASTOID CELL LINES. *(E.)* Schneider, U.
nst. Clin. Virol. Univ. Erlangen-Nürnberg, West
rmany). *Proc Fifth Int Symp Biol Characterization*
n Tumors, Bologna, April 4-6, 1973 1:241-243,
74.

e extent to which complement receptors are detec-
le on the surface of permanent lymphoblastoid
lls was studied using erythrocyte-amboceptor
nplexes prepared by incubation of sheep red blood
lls with diluted rabbit amboceptor. The Burkitt
nphoma group did not reveal complement receptors,
contrast to most other cell lines. Cell lines
ablished from patients with other Epstein-Barr
us (EBV)-associated diseases (e.g. nasopharyn-
l carcinoma and infectious mononucleosis) as well
from healthy donors with anti-EBV-capsid antigen
ers were usually positive. All lines derived
m patients with Hodgkin's disease were uniformly
itive. Two lines derived from patients with
te lymphatic leukemia were negative or slightly
itive. The Burkitt lymphoma group revealed a
arly positive immunofluorescence for Ig-determi-
ts as did all other EBV-associated cell lines.
the present time, the significance of cell mar-
s for cells of lymphoblastoid lines is poorly
erstood; they may be of use in characterizing
ors of lymphatic origin and in investigating
origin of cultured cell lines.

5644 BIOSYNTHESIS OF THE SECOND AND FOURTH COMPONENTS OF COMPLEMENT: INHIBITION *IN VITRO* BY CHEMICAL CARCINOGENS. *(E.)* Colten, H. R. (Harvard Med. Sch., Boston, Mass.) and T. Borsos. *J Immunol* 112(2):1107-1114, 1974.

Fifteen chemical carcinogens and noncarcinogenic analogues were tested *in vitro* for their capacity to affect the biosynthesis of the second (C2) and fourth (C4) components of complement in normal guinea pig peritoneal exudate (PE). 4-Nitroquinoline-*n*-oxide (effective at 10^{-7} M) was the most potent inhibitor of C2 and C4 biosynthesis *in vitro*; its noncarcinogenic analogue, 4-nitropyridine-*n*-oxide had no effect on complement biosynthesis at a concentration of 10^{-5} M. The effect of nitroquinoline-*n*-oxide was irreversible and rapid (less than 1 hr exposure of PE cells). Propriolactone inhibited C2 and C4 biosynthesis more than 80% at concentrations of 10^{-3} and 10^{-4} M, resp. Coumarin, a noncarcinogenic analogue of propriolactone, was ineffective. Diphenylnitrosamine produced 80-90% inhibition of C2 and C4 biosynthesis at 10^{-3} M, while nitrosomethylurethan led to 90% inhibition at 10^{-4} M. Methylurethan, a noncarcinogenic analogue of nitrosomethylurethan, had no effect on C2 and C4 biosynthesis even at 10^{-3} M. Diethylnitrosamine, a known carcinogen, had no effect *in vitro* in C2 and C4 synthesis by PE cells or by spleen and liver fragments. These findings indicate that some carcinogens interfere with at least one normal function of the immune system. Based on a previously reported decrease in serum C4 concentration in guinea pigs given diethylnitrosamine, it is hypothesized that this compound is metabolized *in vivo*, but not *in vitro*, to a compound that affects macrophage function.

5645 THE NATURE OF REED-STERNBERG CELLS AND OTHER MALIGNANT "RETICULUM" CELLS. *(E.)* Taylor, C. R. (Radcliffe Infirm., Oxford, England). *Lancet* 2(7884):802-806, 1974.

Two immunoperoxidase methods were used to investigate the presence of intracellular immunoglobulins in sections of over 100 lymphoreticular neoplasms. Of the reticulosarcomas studied, the nodular forms were primarily positive and the diffuse lymphocytic forms largely negative. Polymorphic reticulosarcomas formed positive and negative groups that differed structurally in cell organelles. Folicular lymphoma specimens where the follicles were mainly small lymphocytes were mostly negative, whereas a greater number of large cells from lymphoblastic tumors were positive. Mononuclear "Hodgkin cells" and Reed-Sternberg cells contained intracellular immunoglobulin in some cases, ranging from almost none to 70% of the cells. The presence of intracellular immunoglobulin within the neoplastic reticulum cells suggests that the immunoglobulin was produced, adsorbed, or phagocytosed by the cells; the first interpretation is preferred. The authors suggest that the various types of lymphoreticular neoplasms may be linked to the different forms of the lymphocyte during its cell cycle. The scheme presented helps explain the presence of intracellular immunoglobulin in some, but not in all, neoplastic reticular cells.

5646 STABILITY OF CYTOPLASMIC RIBONUCLEIC ACID IN A MOUSE MYELOMA: ESTIMATION OF THE HALF-LIFE OF THE MESSENGER RNA CODING FOR AN IMMUNOGLOBULIN LIGHT CHAIN.

(E.) Cowan, N. J. (Med. Res. Council Lab. Mol. Biol., Cambridge, England). *J Mol Biol* 82(1):464-482, 1974.

The half-lives of a number of cytoplasmic RNA species in a mouse myeloma (MOPC 21) were determined by a conventional pulse-chase procedure following uniform labeling of cells with ^{3}H-uridine. Partial purification of the messenger RNA coding for immunoglobulin light chains enabled an estimate of the stability of this species. Centrifugation of uniformly labeled cells and resuspension in 0.1 mM uridine resulted in a 75% drop in the specific activity of the uridine triphosphate pool within 2 hr, followed by a logarithmic decay with a half-life of about 3.5 hr. Exposure of MOPC 21 cells to uridine causes them to swell appreciably and centrifugation at the end of the pulse period is followed by a lag phase of 3 hr before the cells reenter logarithmic growth. Since all chase conditions had certain disadvantages, a comparison of experiments using different chase conditions was undertaken. The stability of the various RNA species did not vary greatly under the different chase conditions. The half-life of the light-chain mRNA is estimated to be 12-14 hr, although a value in the range 5-20 hr cannot be excluded. An RNA fraction including the heavy-chain mRNA behaved similarly. Half-lives determined for other RNA species were 40-60 hr for 18S ribosomal RNA and 28-32 hr for 12S mitochondrial ribosomal RNA. Poly(A)-containing RNA from free polyribosomes decays rapidly in the first 5 hr with a subsequent half-life of 20-30 hr.

5647 AMINO ACID COMPOSITION OF IMMUNOGLOBULIN TYPICAL OF G-MYELOMA.

(Rus.) Cernyavskyi, E. I. (A. V. Palladin Inst. Biochem., Kiev, U.S.S.R.), B. O. Protsenko, V. P. Korotkoruchko and L. M. Sen'ko. *Ukr Biokhim Zh* 46(3):320-323, 1974.

The amino acid composition for immunoglobulin G typical for G-myeloma was determined as part of a comparison study with amino acid composition of immunoglobulin G from blood serum of patients with cancer. The immunoglobulin from patients with G-myeloma was isolated by a sedimentation method similar to that used for isolation of positively reacting protein in the blood serum of cancer patients ('BPR-ORR'). The content of amino acids in the protein was determined using amino acidic analyzer 'Jeol' YLC-3BC. In preparation for analysis, isolated protein was hydrolyzed in 6 N HCl at 110 C for 24, 48, and 72 hr . in vacuum sealed ampules; subsequently, HCl was removed in a vacuum dessicator filled with KOH and the dried residue was dissolved in 0.2 M citric buffer, pH 2.2, and filtered through a No. 4 glass filter. The content of hydrolyzed protein was determined from the amount of nitrogen. The content of tryptophan was determined from an unhydrolyzed protein portion spectrophotometrically in the presence of N-dimethylaminobenzaldehyde. Electrophoresis was conducted in acrylamide gel. Altogether, 17 amino acids were detected in the immunoglobulin of blood serum of G-myeloma. The amino acid composition of that immunoglobulin in comparison with immunoglobulin from the blood serum of cancer patients showed both some peculiarities of its own (higher content of arginine and lower content of serine, threonine and tyrosine) and also some similarities with immunoglobulin from blood serum of cancer patients. The last observation confirms the opinion about some similarity of processes in the malignant growth on the level of synthesis characteristic for this class of protein.

5648 IMMUNOGLOBULIN M SYNTHESIS IN RESTING (G_0) AND IN MITOGEN-ACTIVATED B LYMPHOCYTES.

(E Melchers, F. (Basel Inst. Immunol., Switzerland), L. Lafleur and J. Andersson. *Cold Spring Harbor Conf Cell Proliferation* 1:393-410, 1974.

Changes in synthesis, surface deposition, and molecular conformation of Ig lymphocytes were monitored with increasing time of mitogenic stimulation of the B cells. Active IgM secretion was absent in unstimulated, resting G_0 cells, which synthesized between 1000 and 2000 7-8S IgM molecules/cell during four-hr incubation with radioactive leucine. Median time of disappearance of IgM from small B cells was 20-80 hr. DNA synthesis, measured by uptake of radioactive thymidine by B cells, began 12-24 hr after initiation of mitogenic stimulation. The B cells responded to mitogenic stimulation by the formation of antibody-secreting, plaque-forming cells. Protein and IgM synthesis increased, and active secretion of 19S pentameric IgM was induced. The secreted, polymerized IgM contained the branch sugars galactose and fructose. Ratios of the rate of synthesis of IgM over rates of synthesis of other cellular proteins increased. In B cells stimulated for 44 hr with mitogen, 30% of all IgM molecules labeled within four hr by radioactive leucine were on the surface and 70% were in intracellular compartments. An average B cell stimulated for 72 hr contained between 2 and 5 x 10^6 molecules of 7-8S IgM and secreted 3 to 15 x 10^4 molecules 19S IgM/hr. The median disappearance time for IgM in activated cells was around 4 hr. In the absence of DNA synthesis, activation to increased IgM synthesis and to active secretion occurred earlier than in cells stimulated by the same dose of mitogen but in which DNA synthesis was not inhibited. It is concluded that mitogens provide B cells with two signals of induction, one for the induction of DNA synthesis and cell proliferation, and another for the initiation of increased synthesis and active IgM secretion. Active secretion may result from the displacement of other membrane proteins in lipid bilayers by more and more IgM molecules. For this specialization for active secretion of IgM, a cellular membranous apparatus is developed in B cells which strikingly resembles that of other secretory cells.

5649 IMMUNOGLOBULIN SYNTHESIS AND GLUCOSE-6-PHOSPHATE DEHYDROGENASE AS CELL MARKERS IN HUMAN LYMPHOBLASTOID CELL LINES.

(E.) Bechet, J. M. (Wallenberg Lab., Univ. Uppsala, Sweden), P. J. Fialkow, K. Nilsson, G. Klein and S. Singh. *Exp Cell Res* 89(2):275-282, 1974.

Multiple lymphoblastoid cell lines were established from each of seven Burkitt lymphoma biopsies and

om tonsils removed from four patients with chronic
nsillitis. In each culture, the cell line con-
ined a single enzyme type which was the same as
at found on direct analysis of the tumor. In
ntrast to the variability in the immunoglobulin
ttern from one patient to another, there was lit-
e variation from one line to another line derived
om the same tumor and from recurrent tumors of
e same patient. Five lines from three recurrent
mors in one patient and two lines from one tumor
another patient were found to secrete no immuno-
obulins in the medium. On direct membrane immuno-
uorescence studies, no membrane reactivity was
tected on the cells of these lines. All lines
rived from a biopsy of a female patient homozy-
us for the B gene at the G-6-PD locus contained
ly B-type enzyme. In contrast to lines from
rkitt lymphoma, all lines from tonsils synthesized
munoglobulins; multiple lines derived from the
me tonsil differed from each other in their final
munoglobulin patterns. In tonsil cultures from
-PD heterozygotes, the frequency of lines with
oduction of several heavy or light chains was
gher than the frequency of mixed G-6-PD pheno-
pes. The results indicate that most lines from
rkitt lymphomas are derived from tumor clones
most tonsil-derived lines have multicellular
gin.

0 IDIOTYPIC UNIFORMITY OF CELL SURFACE IM-
MUNOGLOBULIN IN CHRONIC LYMPHOCYTIC LEU-
IA: EVIDENCE FOR MONOCLONAL PROLIFERATION. *(E.)*
roer, K. R. (Washington Univ. Sch. Med., St.
is, Mo.), D. E. Briles, J. A. Van Boxel and J.
Davie. *J Exp Med* 140(5):1416-1420, 1974.

anti-idiotypic serum was prepared against an
unoglobulin G (IgG) paraprotein of a 61-yr-old
with chronic lymphocytic leukemia (CLL). Hemag-
tination inhibition assays showed that the anti-
otypic serum reacted only with the paraprotein
the surface immunoglobulin on the CLL cells.
addition, the idiotypic determinants on the IgG
e located on the Fab portion of the paraprotein
not on either heavy or light chains alone. Vir-
lly all CCL cells from the patient possessed the
idiotypic determinants. Lymphocytes from 16
al donors and from 23 other CLL patients all
ked the idiotypic determinants. That surface
noglobulin on CLL lymphocytes of an individual
ent possesses common variable region markers
orts the thesis that lymphoproliferation in CLL
onoclonal.

ORGAN-SPECIFIC AUTOANTIBODIES IN THYROID
CANCER. *(E.)* Kornstad, L. (Dep. Immunol.,
. Inst. Public Health, Oslo, Norway). *Acta*
ol Microbiol Scand [*A*] (Suppl 248):123-126, 1974.

use of the occurrence of focal lymphocytic infil-
ion of the thyroid around and within thyroid
ers, an examination was made of the incidence of
oid autoantibodies in 619 patients (454 females,
males) with thyroid cancer. The age distribution
he patients was from 6 to 88 yr in the men and
12 to 87 yr in the women. Tests for thyroglobin
antibodies were performed by the tanned-cell haemagglutination technique. Thyroglobulin antibodies, but not thyroid microsomal antibodies, were found more frequently in thyroid cancer patients than in presumably healthy subjects. In thyroid cancer patients, the incidence of thyroglobulin antibodies was markedly higher than in healthy people. The incidence of moderate to high-titered antibodies in male patients was distinctly higher in the cancer series (6.1%) than in the controls (0.3%). In female subjects, the incidence of antibodies was about twice as high in the cancer patients (11.0%) as in the healthy controls (5.2%). In contrast, examinations for thyroid microsomal antibodies were done by the complement fixation method. Thyroid microsomal antibodies were found equally often in thyroid cancer patients (5.6%) and healthy prople (5.9%). The authors incidate that it is difficult to explain the difference between the two antibody categories.

5652 BRIEF COMMUNICATION: QUANTITATION OF CYTOTOXIC ANTITUMOR ANTIBODY *IN VITRO*: A MICROASSAY WITH ^{125}I-IODODEOXYURIDINE AS A TUMOR CELL LABEL. *(E.)* Fritze, D. (Veterans Admin. Hosp., Sepulveda, Calif.), D. H. Kern and Y. H. Pilch. *J Natl Cancer Inst* 53(5):1403-1407, 1974.

A simple, sensitive, and rapid antibody-mediated microcytotoxicity test for the quantitation of cytotoxic antitumor antibodies was developed using murine MC-1 and BP-1 sarcoma cells from tissue cultures and tumor-bearing mice, prelabeled with ^{125}I-iododeoxyuridine (^{125}I-IUDR). The cells, after incubation with various dilutions of xenogeneic (guinea pig) or syngeneic antisera, were then incubated with rabbit complement. The assay required a total reaction time of 2 hr. Tumor-specific cytotoxic activity of 50-80% could be detected at high serum dilutions with syngeneic antisera absorbed with syngeneic spleen cells and could be correlated with the visually observed cell loss. The ^{125}I-IUDR was not significantly cytotoxic to the tumor cells and the use of this label for tumor target cells appears to offer considerable advantages over earlier, more time-consuming and less objective methods for the quantitation of cytotoxic antibodies *in vitro*. The data suggest that the MC-1 and BP-1 sarcomas share common antigens detectable by this serologic test.

5653 SELECTIVE UPTAKE OF SPECIFICALLY PURIFIED ANTIBODIES TO CARCINOEMBRYONIC ANTIGEN OF HUMAN ADENOCARCINOMA. *(E.)* Chao, H. F. (Washington Univ. Sch. Med., St. Louis, Mo.), S. C. Peiper, G. W. Philpott, C. W. Parker and R. D. Aach. *Res Commun Chem Pathol Pharmacol* 9(4):749-762, 1974.

Radioiodinated (^{125}I) Fab-fragments (antigen-binding fragments) of goat anticarcinoembryonic antigen (CEA), prepared by immunoabsorption with Sepharose 4B-CEA, were used to study the binding of specifically purified antitumor antibodies to growing human colonic carcinoma cells *in vitro* and *in vitro*. ^{131}I-normal goat IgG was administered simultaneously as a control for nonspecific adherence. CEA was identified and quantitated in tissue and fluid by radioimmunoassay. *In vitro* studies with human colonic adenocarcinoma cells (HT-29) demonstrated specific binding of ^{125}I-anti-CEA after 1 hr of incubation. *In vivo* studies were conducted on hamsters in which HT-29 cells were transplanted into unilateral cheek pouches. Excision of three tumor-bearing cheek pouches eight days after transplantation demonstrated growing tumors weighing 102-133 mg from which 48-80 ng of CEA was recovered. Labeled Fab preparations were injected into the femoral veins of four hamsters with growing cheek pouch tumors and one and four days later both cheek pouches, the liver, kidneys, and blood were analyzed for radioactivity. The mean uptake ratio of ^{125}I-anti-CEA to ^{131}I-goat IgG one day after injection was 2.51 for the tumor-transplanted pouch, 1.78 for the tumor-free cheek pouch, 1.61 for the liver, 1.48 for the kidney, and 1.30 for the blood. On day four, the mean uptake ratios were 2.78 for the tumor-bearing cheek pouch, 1.52 for the tumor-free pouch, 1.45 for the liver, 1.38 for the kidney, and 1.51 for the blood. These ratios indicate selective uptake of tumor specific antibody. If the degree of specific antitumor antibody localization could be appreciably increased, immunotherapy with cytotoxic antibodies might be feasible.

5654 CYTOTOXIC ANTIBODIES TO CULTURED LYMPHOBLASTS UNRELATED TO EPSTEIN-BARR VIRUS.

(E.) Yang, C. S. (Child. Hosp. Philadelphia, Pa.) and J. F. Hewetson. *Int J Cancer* 14(4):530-538, 1974.

A micro-^{51}chromium release assay was used to examine the possible relationship between antibodies cytotoxic to lymphoid cells and Epstein-Barr virus (EBV) infections in the donors. The studies were conducted using various human sera and Raji cells as the target cells. No correlation was found between sera capable of killing lymphoid cells prelabeled with ^{51}chromium and the presence of antibodies to the EBV viral capsid antigen (anti-VCA). Sera obtained from patients with infectious mononucleosis, Burkitt's lymphoma, nasopharyngeal carcinoma and Hodgkin's disease, known to have elevated titers to anti-VCA, showed cytotoxicity similar to control values. There appeared to be both heat-stable and heat-labile complement-dependent cytotoxic antibodies. Although the data confirms the existence of C'-dependent cytotoxic antibodies for Raji cells in many human sera, the cytotoxic antibodies were unrelated to EBV infections in the donors. Determination of cytotoxic antibodies for Raji cells would seem to be of little value in the study of EBV-associated diseases.

5655 INTERFERON PRODUCTION BY SIMIAN LYMPHOBLASTOID CELL LINES.

(E.) Wright, J. (Rush-Presbyterian-St. Luke's Med. Ctr., Chicago, Ill.), L. A. Falk and F. Deinhardt. *J Natl Cancer Inst* 53(1):271-275, 1974.

Six lymphoblastoid cell cultures, established from tumors induced in cotton-topped and white-lipped marmosets with *Herpesvirus saimiri* (HVS) were studied for spontaneous interferon production over a period of 14 months. Five of six cell lines produced virus inhibitor at levels from 4 to 256 interferon U/ml. The cell lines were virus producing when first established in culture, but production of infectious HVS, formation of infectious centers in permissive cell cultures, and expression of virus-specific antigens by the cells decreased progressively during the 14 months of cultivation with little or no change in levels of interferon production. Interferon production was independent of the HVS strain carried by the cell line or the type of tumor tissue (thymus, lymph node, spleen, peripheral lymphocytes) from which the lymphoblastoid cell cultures were established. Interferon production is often associated with lymphoblast transformation, but appears to be independent of the type of transforming stimulus (e.g. virus, mitogen, o specific antigen).

5656 ANTIGEN SPECIFICITY OF DIFFERENT CELL LINES OF RAT ASCITES HEPATOMA ORIGINATING IN THE SAME INDIVIDUAL.

(E.) Ishidate, M. (Natl. Inst. Hyg. Sci., Tokyo, Japan). *Gann Monogr Cancer Res* (16):195-210, 1974.

Antigenic specificity was tested by neutralization technique in which immunocompetent cells of resistant animals were adoptively transferred into genetically compatible or whole body-irradiated hosts immunized with tumor cells of a different line. *In vivo* and *in vitro* studies were done to determine whether sensitized peritoneal lymphoid cells (PLC) could note antigenic specificity as well as cytological characteristics of rat hepatoma cell lines. Donryu rats of a closed colony were used. PLC from tumor cell-immunized rats inhibited growth of tumor cells while PLC from normal rats and from rats immunized with normal rat liver showed little effect. The PLC effect was enhanced when cells were packed by centrifugation. Destroyed PLC showed no activity on target cells. Cross reactivity of PLC was rarely observed among the cell lines derived from separate hepatoma nodules, suggesting that the antigenicity is individually distinct. No such specificity was noted in four clonal sublines of different chromosomal structure of one of the parent cell lines studied. The results support the existence of TSTA in azo-dye induced rat hepatoma and indicate that chemically induced tumors have distinct antigenic specificity even though originating in the same organ in the same animal.

5657 ANTIGENIC SUBSTANCES CORRESPONDING TO AUTOANTIBODIES IN PATIENTS WITH TUMORS AND AUTOIMMUNE DISEASES.

(E.) Yasuda, Y. (Aichi Cancer Cent. Res. Inst., Nagoya, Japan) and T. O. Yoshida. *Gann Monogr Cancer Res* (16):127-139, 1974.

An antigenic substance reactive with autoantibodies found in cancer patients was purified from calf thymus tissue. The purification procedure included extraction from acetone powder of tissues, batch and column chromatography on diethylaminoethyl (DEAE) cellulose, ammonium sulfate precipitation and gel filtration over Sephadex G-200 and Sepharose 6B. Indirect immunofluorescence technique on cultured human embryo cells from nasopharyngeal cancer (NPC) patient sera was used to detect the antigenic substance. The serum showed a speckled pattern in the resting phase nuclei of the cells. The purified antigenic substance was shown to be a soluble acid protein (molecular weight 2.5 x 10^5) with an isoelectric point around 5.0. Thermal stability up to 60 C and pH stability between 2.6 and 8.5 were shown. The antigen was resistant to digestion with deoxyribonuclease, but was readily destroyed by ribonuclease A or trypsin. The speckled pattern in the cell nuclei was eliminated after digestion with trypsin, pronase or papain. Ribonuclease A or alkaline phosphatase produced a decrease of nuclear fluorescence, while deoxyribonuclease, acid phosphatase, neuraminidase and β-galactosidase had no effect. It is suggested that the antigenic substance showing the speckled pattern might be a protein in association with RNA. The presence of carbohydrate is suggested from periodate oxidation. Immunofluorescence staining of NPC serum metaphasic cells showed no speckled pattern. The relationship of autoantibodies in cancer patient sera to those of autoimmune diseases was studied using blocking tests. In these tests two kinds of IgG conjugated with fluorescein isothiocyanate obtained from sera of autoimmune diseases (dermatomyositis, OY-23; and SLE, OY-10) were used. The results suggest that the autoantibodies were able to cross-react with the same antigenic determinant in the cell nuclei.

5658 PRELIMINARY STUDIES ON THE PRESENCE OF TUMOR-ASSOCIATED ANTIGENS IN HODGKIN'S)ISEASE. *(E.)* Sega, E. (Regina Elena Cancer Inst., Rome, Italy). *Proc Fifth Int Symp Biol Characteri-zation of Hum Tumors, Bologna, April 4-6, 1973* :250-252, 1974.

mmunofluorescence was used in an attempt to demon-trate the presence of tumor-associated antigens in odular lesions of the spleen in patients with odgkin's disease. Splenic tissue was obtained less han three hr after surgery. Cryostat sections of pleen nodules incubated with the absorbed antiserum howed brilliant immunofluorescence, evident around he cells, in cell membranes, and in interstitial paces. Bright masses of material were demonstrated n the connective tissue. Very low or no immuno-luorescence was detected in spleens of Hodgkin's isease without splenic involvement, or in the pleen of a patient involved in a car accident. ne degree of color in the latter two sections was ne same as that demonstrated in controls with luorescein conjugated rabbit antigammaglobulin se-um. It is suggested that studies of this type y aid in establishing a specific immunological ocedure for immunodiagnosis of Hodgkin's disease.

59 HYBRIDS BETWEEN MALIGNANT AND NORMAL CELLS: THEIR TUMORIGENICITY, EXPRESSION OF SUR-CE ANTIGENS, AND RESISTANCE-INDUCING ABILITY. *(E.)* chibana, T. (Natl. Cancer Cent. Res. Inst., Tokyo, pan), T. Dei and C. Nori. *Gann Monogr Cancer Res* 6):183-193, 1974.

description of the characteristics of the hybrids the three FM3A tumor cell lines of the C3H mouse d an 8-azaguanine-resistant subline of the mouse L cell (L_{AG} cell) was made to determine whether FM 3A characteristics would appear dominantly or regressively. All hybrids were maintained in syngeneic hosts during analysis. The FM3A #1 parent cell line was hyperdiploid, with H-2^k histocompatibility and low tumor-specific transplantation antigen (MM antigen) concentration. The FM3A #2 and FM3A/R parent tumor cell lines were hypotetraploid with low H-2^k antigen and high NN antigen concentrations. Cell fusion with the L_{AG} cell suppressed the tumorigenicity of the FM3A lines. Contact inhibition introduced by the L_{AG} cell was lost in FM3A #2 and FM3A/R lines, but remained in FM3A #1 line. H-2^k antigen and L cell antigen expressions were suppressed by all hybrid cell lines, with FM3A #1 suppression being slight. An inverse relationship with regard to MM antigen expression contributed by the FM3A parent cell line was seen in the hybrid lines. The results suggest that the expression or suppression of antigens in the hybrids reflects that of the relevant FM3A parent and therefore shows FM3A characteristics dominantly. This is consistent with similar findings in the Ehrlich tumor hybrids. Rejection-inducing ability was noted in FM3A #2 and FM3A/R hybrids, but not in FM3A #1 hybrids. It is suggested that this factor is related to the MM antigen concentration.

5660 SENSITIZATION TO TUMOUR-ASSOCIATED ANTIGENS IN HUMAN BREAST CARCINOMA. *(E.)* Cochran, A. J. (Dep. Pathol. Glasgow Univ., Scotland), R. M. Grant, W. G. Spilg, R. M. Mackie, C. E. Ross, D. E. Hoyle and J. M. Russell. *Int J Cancer* 14(1):19-25, 1974.

Leukocyte migration technique was used to examine the leukocytes of 138 breast cancer patients and 157 controls for sensitization to breast carcinoma-associated antigen. Significant leukocyte migration inhibition occurred on contact with at least one and up to four breast carcinoma extracts with cells from 74/138 breast cancer patients, while leukocyte migration enhancement was seen with cells from 23/138 patients. Inhibition of migration occurred with the leukocytes of only 24/157 controls and migration was enhanced with the leukocytes of 5/157 controls. The difference between these two groups was very highly significant. Leukocyte migration inhibition occurred at a rate of 56% when cancer patient leukocytes were exposed to extracts of their own tumor as compared to 53% when the extract was from a similar tumor from another patient. Enhancement was significantly more frequent in tests with extracts of homologous tumors. A striking difference existed in the frequency of leukocyte inhibition and enhancement between patients who had clinically localized disease and in patients with spread to the internal viscera. The leukocytes of 2/28 patients with other forms of malignant disease were inhibited by the breast cancer antigens. Extracts of simple breast conditions caused inhibition infrequently and the frequency of inhibition was similar with the leukocytes of carcinoma patients and controls. It is concluded that the leukocyte migration technique is able to discriminate between the leukocytes of breast cancer patients and controls.

5661 LUNG CANCER TUMOUR ASSOCIATED ANTIGEN: ISOLATION BY GEL FILTRATION AND CHARACTERIZATION BY IMMUNODIFFUSION. *(E.)* Sega, E. (Regina Elena Inst. Study Cure Tumors, Milan, Italy), P. G. Natali, C. Ricci, C. T. Mineo and G. Citro. *J Int Res Commun* 2(5):1278, 1974.

Evidence of an abnormal component associated with lung tumor is reported. Neoplastic tissue from ten lung tumor patients (seven epidermoidal carcinoma, two adenocarcinoma, and one undifferentiated carcinoma) was prepared by homogenization in phosphate buffered saline and 30 mg samples were subsequently used for gel filtration on a Sephadex G-200 column. The elution pattern revealed four major peaks of eluted proteins. Eluted fraction analysis using antisera elicited in rabbits against tissue extracts was performed. Unabsorbed antitumor extract antiserum and fraction II of the Sephadex column eluate appeared to recognize different antigenic compounds when reacted in double immunodiffusion in agarose (0.5%) against normal lung tissue extract. The antigen was not detected in normal lung extract. It is suggested that a tissue antigen may be associated with lung tumor undergoing malignant transformation. The antigen in question had the molecular weight of 7S protein, migrated as a α^2-β globulin at pH 8.6 and was soluble at 50% ammonium sulphate saturation. Sera analysis of lung tumor patients for such a component is being conducted.

5662 SEARCH FOR TUMOUR-RELATED BLOOD GROUP A AND B ACTIVITY IN ORAL SQUAMOUS CELL CARCINOMAS. *(E.)* Dabelsteen, E. (R. Dent. Coll., Copenhagen, Denmark). *Acta Pathol Microbiol Scand* [A] 82(2):347-348, 1974.

Squamous cell carcinomas of the oral cavity of 22 patients in blood group O were tested for the presence of blood group A- and B-like substances by a double layer immunofluorescence staining technique. No blood group A or B activity was detected. Normal buccal mucosa from two controls (one blood group A and one blood group B) gave positive reactions. The results indicate that oral squamous cell carcinomas do not generally produce a tumor antigen that is able to cross react with blood group substances A or B. The findings are not inconsistent with the concept that blood group A activity in some oral carcinomas from group A persons is caused by a real A antigen produced by the cancer cells; that the A activity is related to a tumor antigen is less probable.

5663 EXTRACTION OF GROSS SURFACE ANTIGENS FROM AKR MOUSE LYMPHOMA CELLS WITH POTASSIUM CHLORIDE. *(E.)* Brandchaft, P. B. (Natl. Cancer Inst., Bethesda, Md.) and C. W. Boone. *J Natl Cancer Inst* 53(4):1079-1083, 1974.

The physical, biologic, and biochemical properties of the soluble Gross (G) virus-associated surface antigens extracted from cultured AKR mouse lymphoma (AKR-ML) cells were studied. The antigens were extracted in soluble form from the cells using a modified 3M KCl extraction procedure. The paired radioisotopically labeled antibody technique was used to measure total antibody binding to the G surface antigen on the AKR-ML cells, and the immunogenicity of the soluble antigen was tested by immunizing male AL/N mice with the purified antigen then using ARL rat cells to detect an immune response in the immunized mice. Approximately 47% of the surface antigen activity present on the AKR-ML cells was extracted in soluble form with 3M KCl as measured by inhibition of the radioiodinated antibody binding to the surface antigens. The soluble antigen was purified 6.4-fold by precipitation with 60% ammonium sulfate and Sephadex chromatography; this procedure gave a total recovery of 13% of the activity initially detected on the whole cells. The antigen elicited antibody production against Gross surface antigens in the immunization tests with allogeneic mice. The antigen was heat labile but stable at room and colder temperatures, and its activity was retained at pH 7.4-9.0. It was highly susceptible to trypsin digestion. The antigen eluted on Sephadex column in ranges corresponding to molecular weights between 44,000 and 200,000, with a peak near 70,000. The results indicate that 3M KCl extraction gives a higher yield of soluble surface antigens than does papain digestion.

5664 THE *IN VIVO* ACTIVITY OF SOLUBLE EXTRACTS OBTAINED FROM RC19 LEUKEMIA: EFFECT OF THE METHOD OF EXTRACTION. *(E.)* Martyre, M. C. (Hop. Paul Brousse, Villejuif, France), R. Weiner and O. Halle-Pannenko. *Recent Results Cancer Res* 47:405-407, 1974.

The effects of the method of extraction on the *in vivo* activity of soluble antigens prepared from murine RC19 tumor cells were studied. Young adult male and female Balb/c mice were immunized with a soluble extract obtained by the hypotonic lysis of RC19 cells or with an extract prepared in hypertonic potassium chloride. The mice were then challenged with live autochthonous RC19 leukemia cells. Neither extract was demonstrably active when given only prior to tumor challenge in a purely prophylactic system. However, when given three times prior to and three times after tumor challenge, the hypotonic extract resulted in a mild but significant shortening of survival and the hypertonic extract significantly prolonged survival. The results confirm the potential response of the autochthonous host to the tumor antigens and reaffirm the dependence of response on the form of presentation of the antigen.

5665 IMMUNO-FLUORESCENCE AND IMMUNO-ELECTRON MICROSCOPY ON EBV-ASSOCIATED MEMBRANE ANTIGEN OF A NASOPHARYNGEAL CARCINOMA DERIVED LYMPHOBLASTOID CELL LINE (LY-28). *(E.)* Molnar, Z. (Karolinska Inst. Med. Sch., Sweden), P. Biberfeld and G. Klein. *Eur J Cancer* 10(10):633-637, 1974.

The immuno-electronmicroscopic labeling of cell membrane antigen was correlated with the fine structural appearance of virus and virus-induced cytopathic features of cells from a nasopharyngeal carcinoma-derived lymphoblastoid line. Reactive cells showed a variable degree of membrane fluorescence after treatment with Abwao serum, hybrid antibody and 'apofluorretin'; fluorescence was somewhat stronger with conventional Ig conjugated to fluorescein, but the fluorescent patterns were essentially the same. A significantly larger number of cells were labeled in cell preparations treated with ferritin labeled anti Ig as compared to cells treated with hybrid antibody and ferritin. Most extensive surface labeling was seen in a small group of cells which had characteristically altered nuclei and contained intranuclear or cytoplasmic viral particles; most of these cells contained Epstein-Barr virus type components in their cytoplasm or nuclei. Cells treated with anti-HeLa cell serum showed discontinuous segmental labeling of their surface membranes; cells treated with normal human serum did not show labeling of surface membrane or of virus particles. Presence of virus determined antigen on the surface of both types of cells with labeling suggests that they represent early and late states of virus infection, resp. Findings of virus particles within deep cellular invaginations and membrane bound spaces could indicate that virus binding to the cell membrane can trigger an endocytic process.

5666 DEMONSTRATION OF EPSTEIN-BARR VIRUS-ASSOCIATED NUCLEAR ANTIGEN IN NASOPHARYNGEAL CARCINOMA CELLS FROM FRESH BIOPSIES. *(E.)* Huang, D. P. (Queen Elizabeth Hosp., Kowloon, Hong Kong), J. H. C. Ho, W. Henle and G. Henle. *Int J Cancer* 14(5):580-588, 1974.

Fresh nasopharyngeal carcinoma (NPC) biopsies were treated in several ways to yield satisfactory cell preparations for detection of Epstein-Barr (EBV)-associated nuclear antigen (EBNA) by anticomplement immunofluorescence tests. If the cells were well dispersed (trypsinization or extensive mechanical dispersal), few or none were EBNA-positive. In contrast, if the biopsy preparations contained small to moderately sized tissue fragments (touch and squash preparations or limited mechanical dispersal), nuclear staining was detected in nearly every cell at the margin of the fragments or in cell sheets protruding from them. That the stained cells occurred in contiguous sheets or aggregates indicated that they were not lymphoid in nature. The stained cells corresponded to the carcinoma cells when compared with histologically stained replicate cell preparations. Nuclear staining was obtained only with anti-EBNA positive sera (healthy donors, NPC patients, convalescents from infectious mononucleosis) shown to be of antibodies to other nuclear antigens, but not with anti-EBNA negative sera (healthy donors or patients in the early acute phase of infectious mononucleosis. These results confirm and extend previous reports that the EBV DNA found in NPC biopsies resides mainly in the carcinoma cells. Although no cells other than those of lymphoid origin have been found to be infectable or transformable by EBC *in vitro,* the presence of EBNA in the carcinoma cells suggests there might be other types of susecptible cells.

5667 DETECTION OF EPSTEIN-BARR VIRUS-DETERMINED INTRACELLULAR ANTIGENS IN UNFIXED CELLS WITH LABELED ANTIBODIES. *(E.)* Hilgers, F. (Natl. Cancer Inst., Bethesda, Md.), A. Rosen, E. Lamon and G. Klein. *J Natl Cancer Inst* 53(4):949-955, 1974.

By means of radioiodine-labeled antibody elution (RIE) and immunofluorescence, the antigens determined by Epstein-Barr virus (EBV) were detected in human lymphoblastoid cell lines. Raji, Daudi, and P3HR-1 were the cell lines used. The cell lines were maintained as stationary suspension cultures with RPMI-1640 medium, supplemented with 15% fetal calf serum. Both diffuse and restricted subtypes of early antigen were detected by RIE. Cells were used that had been induced to produce early antigen by 25 μg/ml 5-iodo-2'-deoxyuridine. In order to observe the site of the specific antibody binding, utilization was made of fluorescein-labeled antibodies that were specific for the EBV-determined antigens. Results showed that the antibodies bound to the intracellular viral capsid antigen and also to the early antigen. The percentage of cells stained with 0.01% Evans' blue when the antibodies were added to smears following fixation were the same as the cells staining for the antigens when the antibodies were placed on the cells prior to fixation. Therefore, antibodies enter unfixed cells and bind to EBV-determined antigens.

5668 CHARACTERIZATION AND PURIFICATION OF RAUSCHER LEUKEMIA-ASSOCIATED TRANSPLANTATION ANTIGENS. *(E.)* Martyre, M. C. (Hop. Paul Brousse, Villejuif, France), O. Halle-Pannenko and P. Jolles. *Recent Results Cancer Res* 47:401-404, 1974.

The Rauscher leukemia-associated transplantation antigens were purified and characterized. The membrane fractions of RC19 (transplantable ascitic murine leukemia) cells were solubilized by autodigestion and the soluble fractions were purified by isoelectric focusing. The biological activity of the soluble extracts and fractions was then determined *in vitro* by the inhibition of the cytotoxic activity of reference sera. The isoelectric focusing procedure provided a 3- to 4-fold purification of the RC19 cell antigens. The procedure yielded antigenic material absorbable by anti-Friend-Moloney-Rauscher serum in only two of three fractions eluted between pH 6.3 and pH 7.4. Absorptive activity against serum prepared in C57Bl/6 mice by the injection of DBA/2 spleen cells was found in the same fractions. Thus, all the biological activity was eluted in a narrow pH range.

5669 CELL SURFACE ANTIGEN INDUCED BY AVIAN TUMOR VIRUSES IN HAMSTER CELLS TRANSFORMED BY A TEMPERATURE-SENSITIVE MUTANT OF ROUS SARCOMA VIRUS. *(E.)* Aupoix, M. C. (Virol. Unit., INSERM, Lyons, France), J. M. Biquard and A. Cachard. *Int J Cancer* 14(5):611-616, 1974.

A cell surface antigen induced by avian tumor viruses in BHK21/13 hamster cells transformed by a temperature sensitive mutant of Rous sarcoma virus was reported. The hamster cells were transformed at the permissive temperature (37 C) by the mutant FU 19 of the Schmidt-Ruppin strain. They exhibited a temperature-dependent expression of virus-induced surface antigen as assayed by mixed hemadsorption test. This temperature dependence of virus-induced surface antigen was not observed in cells transformed by the wild type virus, SR4, although the number of positive cells was reduced at the restrictive temperature (41 C) when compared to cells incubated at the permissive temperature. The temperature dependency suggests that the appearance of virus-induced surface antigen depends on the expression of viral genes and, in particular, on the production of some specific virus coded proteins. The fact that the expression of virus-induced surface antigen is also variable in the wild type transformed clone (RS2/3) also suggests that a cellular function could be involved in the regulation of virus-induced surface antigen synthesis.

5670 EXPRESSION OF MURINE LEUKEMIA VIRUS STRUCTURAL ANTIGENS ON THE SURFACE OF CHEMICALLY INDUCED MURINE SARCOMAS. *(E.)* Grant, J. P. (Duke Univ. Med. Cent., Durham, N.C.), D. D. Bigner, P. J. Fischinger and D. P. Bolognesi. *Proc Natl Acad Sci USA* 71(12):5037-5041, 1974.

Since chemical carcinogens can activate murine leukemia virus (MuLV), it was determined whether the chemically-induced tumors expressed MuLV structural antigens on their surface membranes and whether these antigens participated in the host's immunological response to the tumors. The cultured cells of C57BL/6N murine sarcomas, which were induced by 3-methylcholanthrene, produced variable amounts of MuLV. By means of radioimmunoassay, it was shown that the cells contained proportional amounts of structural components of MuLV. When monospecific antisera were directed against the major internal antigen, the ribonucleoprotein, and the major MuLV glycoprotein, tumor cell lysis was mediated in the presence of complement. By use of membrane immunofluorescence, it was determined that the viral structural components were surface localized. The presence of structural components of MuLV on the cell surfaces can be independent of both cellular transformation and virus production. The study showed that MuLV structural components were present on the cell surface. The analyses used to investigate these components indicated that the virion proteins were accessible to antibody and could affect cell lysis in the presence of specific antibody and complement.

5671 AN ANALYSIS OF ANTIGENS ON THE SURFACE OF MURINE LEUKEMIA VIRUSES AND CELLS. *(E.)* Aoki, T. (Sloan-Kettering Inst. Cancer Res., New York, N.Y.). *Bibl Haematol* (39):307-315, 1973.

Gross murine leukemia virus (GMuLV)-associated antigens, including cell surface, viral envelope, and soluble antigens, were studied by immunoelectron microscopy. Cell surface antigens (GCSA) on extracellular C-type virions and cells of BALB/c myeloma MOPC-70A were then analyzed in relation to the viral envelope and surface antigens of GMuLV. Results showed at least one specific and one common antigen determinant between their viral envelope antigens. The myeloma specific antigen has been tentatively designated as 'xVEA'. The identification of the MOPC-70A myeloma virus as a distinct subtype may explain the phenotype of these cells, which is GCSA$^+$ G_{IX}- compared with GCSA$^+G_{IX}{}^+$ for GMuLV. Subsequent electron microscopy showed that primary leukemias in rats contained no C-type viruses but that abundant C-type virions appeared in leukemia tissues after a certain number of transplant generations. During progressive growth of transplanted Gross leukemia viruses in syngeneic rats, many virions appear in extracellular spaces as well as in phagocytic vesicles. During periodic regressions, fewer virions are detected in phagocytic vesicles. These observations suggest that antibodies to G antigens produced in tumor-bearing rats suppress virus budding and accelerate the phagocytosis of virions by the host cells. In progressively growing tumors, virions replicate easily because tumor growth overcomes antibody formation, while in regressing tumors increased antibody formation suppresses virus replication. However, Gross leukemia viruses continue to replicate after transplantation into immunized mice which are producing antibody to surface antigen but not the viral envelope antigen. It is therefore possible that host responses to different specificities of G antigens result in counterpart effects on virion replication. In the rat, virions may remain in latent form until released from the host's immunological control.

5672 RADIOIMMUNOASSAY OF THE MAJOR GROUP SPECIFI PROTEIN OF ENDOGENOUS BABOON TYPE C VIRUSES RELATION TO THE RD-114/CCC GROUP AND DETECTION OF ANTIGEN IN NORMAL BABOON TISSUES. *(E.)* Sherr, C. J. (Natl. Inst. Hlth., Bethesda, Md.) and G. J. Todar *Virology* 61(1):168-181, 1974.

A competitive radioimmunoassay for the major group specific (gs) protein of endogenous M7 baboon type C viruses, capable of detecting nanogram quantities, is described, purification, molecular weight and isoelectric point are also given. This assay makes it possible to detect readily the viral gs antigen in cultured cell lines infected with baboon type C virus, and at lower levels in normal baboon testes and spleen; no gs antigen was detected in baboon liver. The gs proteins of five independent baboon viruses were shown to be related to each other by analysis of competitive reactions in which slopes of competition curves and final levels of displacement of test antigens from antigen-antibody complexes wer essentially identical. Detergent disrupted M7 virus, grown in human rhabdomyosarcoma A204 cells or in canine thymus cells, completely displaced labeled M7 gs protein from antigen-antibody complexes in a competitive radioimmunoassay. The use of a homologous test system in the radioimmunoassay gave a highl specific competition, but the gs proteins of woolly monkey type C virus did have a small cross-reaction with Rauscher murine leukemia virus. The gs proteins of baboon type C viruses and those of six independently isolated feline viruses of the RD-114/CCC grou were related but had different competitive curves.

5673 ALPHA-FETOPROTEIN AND GERM CELL TUMORS: A POSSIBLE ROLE OF YOLK SAC TUMOR IN PRODUCTION OF ALPHA-FETOPROTEIN. *(E.)* Talerman, A. (Inst. Radiother., Rotterdam, Holland) and W. G. Haije. *Cancer* 34(5):1722-1726, 1974.

The presence of alpha-fetoprotein was determined in the sera of 48 patients (16 months - 56 yr) with germ cell neoplasms to investigate the effects of therapy, spread, and behavior of the tumor on serum alpha-fetoprotein concentration. Testicular tumors occurred in 37/48 patients, ovarian tumors in 5/48, retroperitoneal tumors in 3/48 and mediastinal tumors in 3/48. Active disease was present in 34/48, while 14/48 were in remission. Raised serum alpha-fetoprotein was found only in patients with active disease; 6/37 patients with testicular tumors, 2/5 with ovarian tumors, 1/3 with retroperitoneal tumors and in 1/3 with mediastinal tumors. Serum alpha-fetoprotein was within the normal range in 18 patients with various nongerminal tumors of the ovary. Serum alpha-fetoprotein determinations are of value in monitoring results of therapy and assessing the presence of metastases and recurrences.

5674 FETAL PROTEINS OCCURRING IN TESTICULAR TERATOMAS. *(E.)* Wahren, B. (Radiumhemmet, Karolinska Sjukhuset, Stockholm, Sweden) and F. Edsmyr. *Int J Cancer* 14(2):207-214, 1974.

The concentrations of alpha-fetoprotein (AFP) and carcinoembryonic antigen (CEA) were determined simultaneously in serial serum samples from 33 patients with teratocarcinomas in various stages. These tumor-associated fetal substances were seen together in four cases, AFP alone was seen in five, CEA alone was seen in three, and neither was seen in two. The embryonic cancer component was present in all primary tumors in which either fetal antigen was detected. AFP was clearly related to the progression or regression of the tumor, while CEA occurred transiently. Four primary teratocarcinomas and four seminomas were established in short-term tissue culture. Only one of the patients from which they were taken had elevated AFP levels. When the original tumor-cell suspensions were assayed by radioimmunoassay or indirect immunofluoresence, however, AFP was detected in three of the teratocarcinomas. CEA was seen in a low percentage of cells from two primary teratocarcinomas. No seminoma cells contained either antigen. The results suggest that most teratocarcinomas produce AFP and/or CEA, although serum assays may be negative. No relationship was found between the occurrence of the two fetal substances.

675 RELATIONSHIP OF SIALIC ACID TO THE EXPRESSION OF FETAL ANTIGENS IN THE DEVELOPING AMSTER FETUS. *(E.)* Hannon, W. H. (Mol. Anat. rogram, Oak Ridge Natl. Lab., Tenn.), N. G. Anderon and J. H. Coggin, Jr. *Biochem Dis 4* (Part B): 69-684, 1974.

he possibility that deposition of sialic acid in etal cells may be responsible for alterations in he antigenicity of these cells was investigated. Fibrosarcomas were induced by injection of simian virus 40 (SV40) tumor cells into syngeneic adult LVG/LAK hamsters and by the injection of SV40 into neonatal hamsters. Expression of a fetal antigen cross-reactive with SV40-induced tumor neoantigen was demonstrated by various immunologic tests on the ninth and tenth days of gestation. Antigenicity terminated abruptly on the 11th day of gestation. Deposition of sialic acid was monitored for the developing hamster through fetal, neonatal, and suckling stages. Total bound sialic acid increased from the tenth through the 15th day of gestation. Concentrations in neonatal and suckling hamsters were not different from those of the 15-day-old fetus. Sialic acid levels in the membrane, microsomal and soluble fractions reflected the same trend as observed for total sialic acid, whereas the mitochondrial fraction appeared to remain constant. Similar investigations of sialic acid were carried out on SV40-induced tumor tissue of hamsters. Alterations in concentrations for this tissue were consistent with those seen with fetal tissue. These results suggest a role for sialic acid in the maturational traits of the plasma membrane and implicate the deposition of sialic acid in the masking of fetal antigens. The abrupt nature of the masking process in fetal development suggests that a switching on of specific genes involved in the synthesis and incorporation of sialic acid may occur at this interval in gestation.

5676 LYMPHOCYTE TRANSFORMATION AND PRODUCTION OF A HUMAN MONONUCLEAR LEUCOCYTE CHEMOTACTIC FACTOR IN PATIENTS WITH HODGKIN'S DISEASE. *(E.)* Ruhl, H. (Dep. Hematol., Free Univ. Berlin, Germany), W. Vogt, G. Bochert, S. Schmidt, H. Schaoua and R. Moelle. *Clin Exp Immunol* 17:407-415, 1974.

Human peripheral lymphocytes stimulated *in vitro* with phytohemagglutinin (PHA) produce a factor with chemotactic activity for homologous monocytes. The production of this factor and lymphocyte transformation was studied in 20 patients with Hodgkin's disease (eight women and 12 men, aged 14-72 yr). For the chemotaxis assay, lymphocytes were incubated with 0.3 µg/ml PHA without serum and incorporation of ^{3}H-thymidine measured at 24 hr; for the lymphocyte transformation test, cells were incubated with 1.0 µg/ml PHA, and ^{3}H-thymidine incorporation measured after 72 hr and 144 hr. Patient lymphocyte response to PHA was significantly depressed at 72 hr (mean 26,000 cpm) compared with the response of 18 healthy controls (mean 133,000 cpm). While a wide scatter of responses was observed in both groups, only a few patients had responses in the normal range, including three of four patients in remission. After six days of culture, the mean response of patients increased (51,000 cpm) but was still subnormal. Normal lymphocytes exhibited maximal DNA synthesis after 72 hr of incubation, as did lymphocytes from three patients in remission. The chemotactic activity was slightly decreased in supernatants of lymphocyte cultures from patients compared with controls, but this decrease was not significant. Mean values were 251 migrated cells in the control group and 212 migrated cells in the patient group. Further investigation showed that neither PHA-induced DNA synthesis nor production of chemotactic factor depended on absolute lymphocyte counts in peripheral blood. This study demonstrates that production of chemotactic factor is normal in patients with Hodgkin's disease, whereas the lymphocyte response to PHA is greatly diminished. Whether these immunological activities reside in the ability of a single cell line of pluripotential cells or indicate a functional heterogenity within the peripheral T lymphocyte remains to be determined.

5677 THE EFFECT OF CYCLIC NUCLEOTIDES ON PURINE BIOSYNTHESIS AND THE INDUCTION OF PRPP SYNTHETASE DURING LYMPHOCYTE ACTIVATION. *(E.)* Chambers, D. A. (Sch. Med., Univ. California, San Francisco), D. W. Martin, Jr. and Y. Weinstein. *Cell* 3(4): 375-380, 1974.

A study was made of the regulation of mammalian gene expression using the activation of lymphocytes. A system was utilized comprising BALB/c mouse spleen lymphocytes in RPMI 1640 culture medium (pH 7.8) without serum. Lymphocytes were maximally activated by a concentration of Concanavalin A (Con A) of 0.25 μg/ml of cell suspension. Beginning 20 hr after the addition of Con A, an increase in the rate of DNA synthesis as much as 1000 fold was observed. The rate of accumulation of formyl glycineamide ribonucleotide (FGAR), a purine intermediate, began to increase eight hr after addition of Con A, and at 20 hr its rate of accumulation reached values as great as 100-fold that of the resting cell. When dibutyryl cyclic GMP (2×10^{-4} M) was added to the suspensions of lymphocytes, there was a ten fold increase in DNA synthesis. After Con A addition, phosphoribosyl pyrophosphate (PRPP) synthetase activity increased as much as 10-fold. The addition of dibutyryl cyclic AMP (2×10^{-4} M) to Con A-treated lymphocytes stimulated DNA synthesis and the appearrance of PRPP synthetase (cyclic GMP-sensitive). Therefore, cyclic nucleotides are important in purine biosynthesis regulation and in the mechanism of activation of lymphocytes.

5678 THE LYMPHOCYTE RESPONSE TO PRIMARY MOLONEY SARCOMA VIRUS TUMORS: DEFINITION OF A NONSPECIFIC COMPONENT OF THE *IN VITRO* CELLULAR HYPOREACTIVITY OF TUMOR-BEARING HOSTS. *(E.)* Kiessling, R. (Dep. Tumor Biol., Karolinska Inst., Stockholm, Sweden), G. Bataillon, E. W. Lamon and E. Klein. *Int J Cancer* 14(5):642-648, 1974.

Adult CBA mice injected i.m. with Moloney sarcoma virus (MSV, 0.1 ml) developed tumors within 5-18 days which usually completely regressed within one month. Maximal tumor size was variable, occurring between 10-15 days. Spleen lymphocytes from regressor and tumor-bearing mice were examined for activity against syngeneic target cells bearing the Moloney leukemia virus-associated cell-surface antigen. As previously demonstrated with BALB/c mice, lymphocytes from regressor mice were significantly more active against target cells in microtoxicity tests than lymphocytes from tumor-bearing mice. In other experiments, MSV-infected CBA mice were injected i.p. with mastocytoma P815 (H-2^d) cells (2×10^7) and 10-13 days their lymphocytes tested for cytotoxicity against H-2^d target cells in ^{51}Cr-release assays. By day 10-16 after MSV infection, lymphocytes from tumor-bearing mice were significantly less active against the H-2^d antigens than those of animals tested prior to the development of tumor or those in which the tumors had regressed. It is therefore concluded that a major component of cellular hyporeactivity, as measured by *in vitro* cytotoxicity in these primary MSV tumor-bearing hosts, is nonspecific.

5679 EVALUATION OF T-LYMPHOCYTE REACTIVITY IN LEUKEMIA PRONE AKR MICE. *(E.)* Biasi, G. (Inst. Pathol. Anat., Univ. Padova, Italy), D. Collavo, A. Biasi and L. Chieco Bianchi. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:261-265, 1974.

The function of lymphocytes from the peripheral blood and the spleen of normal and preleukemic AKR mice was investigated and the T-lymphocyte reactivity of AKR mouse lymphocytes was compared with that of CBA mice, a strain which has the same H-2 histocompatibility locus but is characterized by a low incidence of spontaneous leukemia. No significant difference in the uptake of tritiated methyl-thymidine (1.5 μCi/ml for six hr) was observed between normal and preleukemic mice. In the preleukemic mice there was no decrease in the number of phytohemagglutinin-responsive lymphocytes per 10^6 peripheral blood and spleen cells. The tritiated thymidine incorporation per 10^6 phytohemagglutinin-stimulated peripheral blood cells was significantly higher in CBA than in AKR mice. These results indicate that the number of phytohemagglutinin-responsive lymphocytes in peripheral blood and spleen cells is markedly lower in the AKR strain than in the CBA strain. An impairment of immune reactivity seems to exist in the AKR mice.

5680 THE BEHAVIOR OF RESTING BONE MARROW CELLS IN RATS WITH ACUTE LEUKEMIA. *(E.)* Hoelzer, D. (Clin. Res. Cent., Univ. Ulm, West Germany), E. B. Harriss and R. J. Haas. *Bibl Haematol* (39):1008-1013, 1973.

An experimental transferable rat leukemia (L5222) was used in order to determine serial changes in bone marrow function following leukemia injection. Forty-two BDIX rats were injected with 10^7 L5222 cells and examined at 12 hr intervals for seven days. Erythrocyte remained constant up to 3-5 days, platelets up to three days and then both decreased. Granulocytes, lymphocytes, and leukemic blast cells increased between days three and five and the number of granulocytes and lymphocytes then decreased. Bone marrow studies revealed that megakaryocytes and basophilic erythroblasts remained constant for two to three days and then dropped off substantially. Promyelocyte and myelocyte levels remained constant for 4.5 days after which they decreased. Proerythroblasts and myeloblasts were excluded due to difficulties in distinguishing them from leukemic blast cells. The behavior of resting bone marrow cells was also studied using 100% ^{3}H-thymidine labeling. The results indicated no changes in the reticulum cells during leukemia development followed by a 66% decrease in small lymphocytes. It is concluded that an interaction occurs between normal and leukemic cells at the stem cell level during hemopoiesis.

5681 THE T OR B NATURE OF NEOPLASTIC CELLS IN LYMPHATIC LEUKEMIA. *(Fr.)*

Belpomme, D. (Fred-Siguier Unit Ther. Dev., Paul-Brousse Hosp., Villejuif, France), D. Dantchev, E. Rusquec, D. Grandjon, R. Huchet, F. Pinon, P. Pouillart, L. Schwarzenberg, J.-L. Amiel and G. Mathe. *Bull Cancer (Paris)* 61(3):387-402, 1974.

Blood samples and/or bone marrow samples from 20 patients with acute lymphoid leukemia were tested for presence of T and B lymphocytes. The tests used were the spontaneous rosette test for E rosettes for T lymphocytes; tests for antigen-antibody complexes (EA rosettes) and antigen-antibody-complement complexes (EAC rosettes) for B lymphocytes; and immunofluorescence to detect membrane immunoglobulins. Presence of membrane immunoglobulins indicates B lymphocytes and absence indicates T lymphocytes. No marker at all was found for 15 of the 20 cases of acute lymphoid leukemia. The other five patients included three cases of prolymphocytic leukemia, one of micro- and one of macrolymphoblastic leukemia. For these three types, the leukemic cells which formed E rosettes were, resp., 35-39%, 65% and 80% for the bone marrow samples; 15-45% not determined; and 50% for peripheral blood samples. These results demonstrate the presence of T lymphocytes and are taken to suggest that the thymus may play a role in human leukemia. In addition, 17-30% of the cells formed EAC rosettes, so B lymphocytes may also be present. For 6 patients in complete remission, the percentage of B lymphocytes rapidly attained the normal value, while the ercentage of T lymphocytes remained elevated for p to 40 weeks.

682 STUDIES OF POLY(A)-BEARING RNA IN RESTING AND GROWING HUMAN LYMPHOCYTES. *(E.)*

Cooper, H. L. (Natl. Inst. Dent. Res., Bethesda, Md.). *Cold Spring Harbor Conf Cell Proliferation* 1:769-783, 974.

survey of some characteristics of poly(A)-bearing NA [poly(A)-RNA] in lymphocytes in the resting stage and shortly after growth stimulation is presented. Both the hnRNA and cytoplasmic RNA of human lymphocytes included molecules containing poly (A) sequences, but the largest hnRNA molecules appeared deficient in such sequences. No apparent rogressive shortening or cleavage of poly(A)-hnRNA occurred with extended processing time. This suggests that for the bulk of hnRNA, once the poly(A) egment is attached, the molecule is thereafter ither degraded or conserved, but not appreciably ltered in size. Only a small proportion of whole ell poly(A)-RNA labeled after three hr reached the ytoplasm; these cytoplasmic molecules had a different size distribution from poly(A)-hnRNA, with maller molecules more heavily represented. Growth imulation altered the size distribution of whole ll poly(A)-RNA (presumably poly(A)-hnRNA) but had ttle effect on the size distribution of cytoplas- c poly(A)-RNA. Both the rates of synthesis and of processing and transport of newly synthesized poly(A)-RNA to the cytoplasms increased after growth stimulation. A discrete peak at ∿ 11.5S (molecular wt 250,000) was always seen in cytoplasmic and in polysomal poly(A)-RNA; the remainder of the distribution was heterogenous and was similar in resting and growing cells. Radioactivity in cytoplasmic poly(A)-RNA labeled during a pulse period declined rapidly during the first several hr of chase incubation. Thereafter a plateau was reached in both resting and growing cells, suggesting that a stable form remained. Addition of phytohemagglutinin to resting lymphocytes treated in this way caused a shift in the distribution of surviving labeled poly-(A)-RNA in sucrose gradient regions. Poly(A)-RNA molecules apparently moved from the 40S and ribosome regions to the polysome region; this was accompanied by an increased number of polysomes formed from preexisting ribosomes. Since mRNA sedimenting in the 40S region is not actively associated with any protein synthesizing machine, this material may be "masked" RNA which is rapidly activated upon growth stimulation. The proteins encoded by this mRNA may serve control and structural functions essential to the activation of G_0 cells. That the resting human lymphocyte population is composed primarily of T cells indicates that the behavior of masked mRNA relates to T cell activities.

5683 CHARACTERISTICS OF THE LYMPHOCYTE-MEDIATED CYTOTOXIC REACTION *IN VITRO*. *(E.)*

Hashimoto, Y. (Tokyo Biochem. Res. Inst., Japan) and H. Sudo-Kitagawa. *Gann Monogr Cancer Res* (16):73-88, 1974.

Two assay systems for lymphocyte-mediated cytotoxic reaction *in vitro* were established and the characteristics of the reaction studied. Lymphocytes from Donryu rats immunized with Yoshida sarcoma cells and lymphocytes from inbred mice immunized with allogenic leukemia cells were used as aggressors against the immunizing tumor cells. Peritoneal lymphocytes were found to be the more effective in target cell destruction in both systems. Target cell lysis determinations were by visual count or ^{3}H-uridine method. Cytotoxicity of lymphocytes from mice (several strains with specific H-2 specificities) allogeneically immunized showed target cell destruction rate decrease with the number of H-2 specificities directed by the lymphocytes. When the specificity equaled one, cells were not destroyed. The rapidity of the cytotoxic reaction was found to be dose-related and a function of the immunization of the donor animal. Adherence of lymphocytes was lethal at two lymphocytes/Yoshida sarcoma cell and one lymphocyte/leukemia cell resp. Adhering lymphocytes were found to survive after lysis of target cells. A temperature requirement of 25 C for adherence and 37 C for adherence and lysis of target cells was noted. Data from *in vitro* cultures of the adhering lymphocytes revealed an enhanced cytotoxic activity. When sensitized lymphocytes were combined with two target cells, destruction was immunologically specific. Protease treatment of sensitized lymphocytes had no effect on adherence or cytotoxicity. Sensitized lymphocytes destroyed target cells rapidly and quantitatively *in vitro*. The results imply that adherence of the sensitized lymphocyte to the target cell may be the first step in cell destruction. The author suggests that the adhering lymphocytes are effector cells for the respective targets, and has calculated the total effector cells as 8% and 20% (rat and mouse resp.).

5684 CYTOCHEMICAL PROFILE OF B AND T LEUKAEMIC LYMPHOCYTES WITH SPECIAL REFERENCE TO ACUTE LYMPHOBLASTIC LEUKAEMIA.

(E.) Catovsky, D. (R. Postgrad. Med. Sch., London, England), J. Galetto, A. Okos, E. Miliani and D. A. G. Galton. *J Clin Path* 27(10):767-771, 1974.

Periodic acid-Schiff and acid phosphatase tests were applied to films from peripheral blood, buffy coats and/or bone marrow of 18 patients with high leukocyte counts (eight chronic lymphocytic, three prolymphocytic and seven acute lymphoblastic leukemia). The acid phosphatase test was carried out in the presence of 0.05 M L(+) tartaric acid. All chronic and two prolymphocytic patients had B-cell markers and one prolymphocytic and three acute lymphoblastic patients had T-cell markers. One acute patient with an anterior mediastinal mass was considered T-cell due to a significant response to PHA (phytohemagglutinin) in spite of a lack of T-cell markers. Four patients with acute lymphoblastic leukemia lacked either type of marker (non-T). All B-cells showed positive PAS reactions in 80-95% of the cells while the acid phosphatase reaction was strong in the T-cells. In the non-T patients the acid phosphatase test was negative in two and 23% moderate positive in another, while the PAS reaction was strongly positive in more than 40% of the cells. A tartrate-resistant acid phosphatase was found in some of the prolymphocytes. The results imply that a distinct T-cell variant of acute lymphoblastic leukemia may be recognized by a positive acid phosphatase reaction and a weak or negative PAS reaction. A positive acid phosphatase reaction is not seen in the more common non-T type of acute lymphoblastic leukemia.

5685 SPECIFICITY OF ^{51}CR-RELEASE CYTOTOXICITY OF LYMPHOCYTES IMMUNE TO MURINE SARCOMA VIRUS.

(E.) Herberman, R. B. (Natl. Cancer Inst., Bethesda, Md.), T. Aoki, M. Nunn, D. H. Lavrin, N. Soares, A. Gazdar, H. Holden and K. S. S. Chang. *J Natl Cancer Inst* 53(4):1103-1111, 1974.

Immune reactivity, evaluated by cytotoxicity assay, of spleen cells harvested from C57Bl/6 (B6) mice 13-16 days after infection with Moloney sarcoma virus (MSV) was studied by incubation with ^{51}Cr-labeled target RBL-5 cells and one of 32 types of unlabeled mouse cells. Inhibition of ^{51}Cr-release was observed with five of the cell types from the B6 donor strain indicating a sharing of surface antigens similar to those of the RBL-5 target. These results correlated with with direct cytotoxicity tests. Further tests showed that, in general, cells from B6 mice infected with Friend, Moloney or Rauscher virus were inhibitory in the cytotoxicity test, whereas Gross virus or leukemic BALB/c cells induced by Rauscher or Moloney virus were not. Some spontaneously virus-transformed and BUdR-activated cells were positive. The common antigenic factor revealed by these studies appears to be the expression of an endogenous C-type virus particle rather than Moloney sarcoma virus antigen; a phenomenon revealed through the use of cell-mediated immunity rather than humoral immunity. This new form of antigenic expression is tentatively designated as MEV-SA-1.

5686 LYMPHOCYTE CYTOTOXICITY IN HUMAN ACUTE LEUKEMIA.

(E.) Leventhal, B. G. (Natl. Cancer Inst., Bethesda, Md.), R. H. Halterman, E. B. Rosenberg, J. L. McCoy and R. B. Herberman. *Recent Results Cancer Res* 47:113-117, 1974.

The cytotoxicity in human acute leukemia lymphocytes was studied *in vitro* using ^{51}Cr-labeled target cells. All patients had either acute lymphatic leukemia (ALL) or acute myelogeneous leukemia (AML). Acute leukemia blast cells were obtained by leukophoresis and stored in liquid nitrogen with 10% dimethylsulfoxide (DMSO). Normal peripheral blood lymphocytes from treated patients were used as attacking cells in the lymphocyte cytotoxicity assay (LCA). Target cells in the assay were labeled with ^{51}Cr and a 60:1 attack to target-cell ratio was employed. The amount of ^{51}Cr released was measured and expressed as a percentage of the total ^{51}Cr. ALL patients (8/20) and AML patients (6/19) showed reactivity against autologous blast cells, with no activity noted against normal cells; no correlation to clinical stage was seen. In allogeneic target cells cross reactivity was high. The delayed hypersensitivity skin test and mixed leukemia cultures using autologous mitomycin-treated leukemia cells showed no correlation between the different tests being run simultaneously in the same patient (20 cases). The results show that acute leukemia patients have cell-mediated immune reactions to autologous leukemia cells. Patient lymphocytes were seen to be cytotoxic to autologous and allogeneic blast cells and to cultured human lymphoblasts, but not to remission cells or normal cells. Further studies of the relationship between chemotherapy and the lymphocyte responsible for cytotoxicity is necessary.

5687 T- AND B-LYMPHOCYTES AND LYMPHOBLASTS IN UNTREATED ACUTE LYMPHOCYTIC LEUKEMIA.

(E.) Borella, L. (St. Jude Child. Hosp., Memphis, Tenn.) and L. Sen. *Cancer* 34(3):646-654, 1974.

The peripheral blood and bone marrow lymphocytes and/or lymphoblasts of 14 children with untreated acute lymphocytic leukemia (ALL) were studied at the time of diagnosis for T- and B-cell markers. B-cells were assayed by immunofluorescent staining and T-cells were assayed by spontaneous rosette formation with sheep erythrocytes (SRBC). In nine of the children, the assays were repeated during remission of the disease. The peripheral blood and bone marrow samples of the untreated patients showed the coexistence of two main subpopulations of lymphoid cells: small lymphoid cells which bore the same T- and B-surface markers as normal lymphocytes and blasts which in ten of the patients lacked these markers. In two patients, more than half of the bone marrow blasts had T-cell surface receptors, however, and in two others the proportion of blasts forming rosettes was 2% and 17%, respectively. The initial blast cell count in the peripheral blood was greater than $10^5/mm^3$ in both of the children with the higher proportion of T-lymphoblasts. In addition, one of these children had a large anterior mediastinal mass, probably thymus. After the successful induction of remission, there was an increase in the proportion of normal T-lymphocytes in the bone marrow of all nine children assayed. The results suggest that the presence of T-lymphoblasts, which may be of thymic origin, is correlated with a more advanced disease at the time of diagnosis.

5688 LYMPHOTOXIN PRODUCTION AND BLAST CELL TRANSFORMATION BY CORD BLOOD LYMPHOCYTES: DISSOCIATED LYMPHOCYTE FUNCTION IN NEWBORN INFANTS.

E.) Eife, R. F. (Univ. Colorado Sch. Med., Denver), . Eife, C. S. August, W. L. Kuhre and K. Staehr-Johansen. *Cell Immunol* 14(3):435-442, 1974.

he correlation between phytohemagglutinin-stimulated last cell transformation and lymphotoxin production as studied in the lymphocytes of a group of normal ewborn infants and compared with a group of normal dults. Umbilical cord blood was obtained from 17 ull-term infants and peripheral venous blood from 2 adults (20-35 yr). Every newborn studied was paired to at least one adult control; 24 pairs were anlyzed. Triplicate cultures were established by inculating 2×10^5 mononuclear cells (lymphocytes and onocytes) into 1.5 ml medium and incubating it at 7 C. After 72 hr, 1.0 μCi of ^{3}H-thymidine was aded and incubation was continued for three more hr. adioactivity was estimated by scintillation specrometry and lymphocyte transformation was expressed s the difference between the mean counts per minute cpm) in the PHA-stimulated and control cultures. en thousand viable target cells (from a cell line erived from a human hepatoma) were incubated at 37 for 36 hr with cell-free culture medium in order o assay the cytotoxicity of the latter. During the ast three hr of incubation, 0.5 μCi of ^{3}H-thymidine as added and radioactivity was counted. The lymphooxin activity was expressed as the percent inhibtion of target cell DNA synthesis by the cell-free ulture medium from PHA-stimulated lymphocytes relaive to the DNA synthesis in target cultures exposed o medium from unstimulated lymphocytes. Mean blast ell transformation was 106,000 cpm for newborns and 2,000 for adults. Newborn lymphocytes produced sigificantly less lymphotoxin than did adult lymphoytes. Inhibition of target cell DNA synthesis was 4% for newborns and 60% for adults. Relative to n equivalent extent of blast cell transformation, ewborn lymphocytes produce only about 25% as much ymphotoxin as do adult lymphocytes. Determination f the age at which the infants' lymphocytes achieve ormal lymphotoxin is of considerable interest along ith knowledge of intracellular events which occur uring this maturation period.

5689 SOMATIC CELL HYBRIDS BETWEEN MOUSE PERITONEAL MACROPHAGES AND SV40-TRANSFORMED HUMAN CELLS. I. POSITIVE CONTROL OF THE TRANSFORMED PHENOTYPE BY THE HUMAN CHROMOSOME 7 CARRYING THE SV40 GENOME.

(E.) Croce, C. M. (Wistar Inst. Anat. Biol., Philadelphia, Pa.) and H. Koprowski. *J Exp Med* 140(5):1221-1229, 1974.

Mouse peritoneal macrophages were hybridized with simian virus 40 (SV40)-transformed human cells, deficient in hypoxanthine guanine phosphoribosyltransferase (HGPRT), to demonstrate that the human chromosome 7, carrying the viral genome codes for "transforming factors," is responsible for expression of the transformed phenotype. Hybrid cells continued to proliferate *in vitro* with all the characteristics of transformed growth. Clones of these cells revealed, on karyological analysis, the universal presence of human chromosome 7 plus one or more other human chromosomes; most of the mouse chromosome sets were quasi-tetraploid. The retention of transformed growth characteristics in the hybrid cells and universal presence of chromosome 7 (sometimes the only human one in the hybrid karyotype) provided the evidence that the SV40 viral genome was incorporated into this particular chromosome. The fact that the human transforming genome had a dominant effect in progeny of somatic fusions between mouse and human heterokaryotypes suggests that fusions of this type may be used to identify viral genomes in other human cell lines.

5690 AGGLUTINATION BY CONCANAVALIN A OF NORMAL CHICK EMBRYO FIBROBLASTS TREATED BY 5-BROMODEOXYURIDINE (BrdU).

(E.) Biquard, J.-M. (Found. Curie Inst. Radium, Orsay, France). *J Cell Physiol* 84(3):459-462, 1974.

The effect of 5-bromodeoxyuridine (BrdU) on the agglutination of chick embryo fibroblasts by concanavalin A (Con A) was studied *in vitro*. Secondary cultures of chick embryo (CE) fibroblasts were grown for two days in the presence of BrdU (1-8 μg/ml) then treated for 15 min with Con A. Subconfluent monolayer cultures of CE cells treated with BrdU showed an increase in agglutinability by Con A to a degree comparable to that observed following transformation with Rous sarcoma virus (RSV). This increased agglutinabilty persisted for three weeks through four passages of the cultures. Thymidine in high doses (40 μg/ml), but not in low doses (4-6 μg/ml) prevented this effect, as did α-methyl D-glucopyranoside (5×10^{-3} M) and D-glucose. BrdU-treated cells incubated with 50 μc/ml of (^{3}H)uridine appeared to release no virus particles into the medium, and there was no increase in the uptake of D-glucose by the BrdU-treated cells. BrdU treatment of CE cells prior to infection with a temperature-sensitive mutant of RSV prevented the loss in agglutinability normally seen at the nonpermissive temperature (41 C). The data indicate that the increased agglutinability produced by low doses of BrdU is probably due to a different alteration in the cell surface than is seen in RSV-transformed cells. A possible alteration in polysaccharide and protein synthesis in the BrdU-treated cells is being investigated.

5691 MEMBRANCE IMMUNOGLOBULIN IN ACUTE LYMPHOCYTIC LEUKAEMIA CELLS. *(E.)* Astaldi, A., Jr. (Div. Hematol. Oncol. Pediatr., Inst. G. Gaslini, Genoa, Italy), A. Martini, M. I. Franchini and L. Massimo. *Haematologica (Pavia)* 59(1):38-45, 1974.

5692 INTRACELLULAR LYMPHOCYTE IN NORMAL AND NEOPLASTIC CERVICAL EPITHELIUM. *(E.)* Lahiri, V. L. (S. N. Med. Coll., Agra, India). *Indian J Pathol Bacteriol* 17(3):170-174, 1974.

5693 DIFFERENCE BETWEEN EMBRYONIC AND TUMOR-SPECIFIC ANTIGENS ON CHEMICALLY INDUCED TUMORS. *(E.)* Baldwin, R. W. (Cancer Res. Campaign Lab., Univ. Nottingham, UK) and B. M. Vose. *Con Embryonic Fetal Antigens Cancer (Knoxville) November 4-7, 1973* 3:23, 1973.

5694 GRAFT-*VERSUS*-HOST REACTIONS, TUMOR SPECIFIC IMMUNITY AND SELF TOLERANCE. *(E.)* Britton, S. (Karolinska Inst. Wallenberglab., Stockholm, Sweden). In: *Immunological Tolerance: Mechanisms and Potential Therapeutic Applications* edited by D. H. Katz and B. Benacerraf. Boston, Academic Press, 1974, 319-332.

5695 IgG MYELOMA, SIA TEST, AND SERUM HYPERVISCOSITY. *(E.)* Rubies-Prat, J. (Polyclin. of Social Security, Autonomous Univ., Barcelona, Spain), M. T. Gallart, J. C. Friscon, A. Caralps, S. Schwartz and R. Bacardi. *Acta Haematol* 52(2):107-111, 1974.

5696 EXCHANGES BETWEEN BLOOD AND EXTRAVASCULAR LYMPHOCYTES IN HUMAN CHRONIC LYMPHOCYTIC LEUKEMIA. *(E.)* Manaster, J. (Serv. Intern. Med. Clin. Invest., Inst. Jules Bordet, Brussels, Belgium), P. Stryckmans and J. Fruhling. *Bibl Haematol* (39):1022-1029, 1974.

5697 IMMUNOFLUORESCENCE DETECTION AND ISOLATION OF TUMOUR-SPECIFIC ANTIGENS. IMMUNOGENIC ACTIVITY ASSAY BY MACROPHAGE INHIBITION TEST (MIF) AND LYMPHOCYTE BLASTOGENESIS. *(E.)* De Barbieri, A. (Lab. Biochem. Immunochem. Inst. Sieroter. Milan., Milan, Italy), A. P. Mistretta, A. Golferini, G. Chiappino and G. C. Tassi. *Boll Ist Sieroter Milan* 53 (1): 66-74, 1974.

5698 IMMUNOSUPPRESSIVE ACTIVITY OF N-NITROSO-N-METHYLUREA (MNU) AND DIMETHYLNITROSAMINE (DMN). *(E.)* Waynforth, H. B. (Middlesex Hosp. Med. Sch., London, England) and P. N. Magee. *Br J Cancer* 29(1):92, 1974.

5699 STRUCTURE STUDIES OF THE GLYCOPROTEINS ASSOCIATED WITH CARCINOEMBRYONIC ANTIGEN (CEA) ACTIVITY. *(E.)* Chu, T. M. (Roswell Park Mem. Inst., Buffalo, N.Y.), A. K. Bhargava and S. R. Harvey. *Fed Proc* [II] 33(5):1562, 1974.

5700 PERSISTENCE OF TUMOR-SPECIFIC AND H-2 ANTIGENS ON MURINE METHYLCHOLANTHRENE-INDUCED TUMOR CELLS IN LONG-TERM CULTURE. *(E.)* Klein, P. A. (Coll. Med., U. Florida, Gainesville). *J Reticuloendothel Soc* 15(6):69a, 1974.

5701 PHAGOCYTOSIS PROMOTING CAPACITY OF PLASMA DURING TUMOR GROWTH AND FOLLOWING THE VASCULAR ENTRANCE OF TUMOR CELLS. *(E.)* Saba, T. M. (Albany Med. Coll., Albany, N.Y.), T. G. Antikatides and J. R. Lorenzen. *J Reticuloendothel Soc* 15(6): 18a, 1974.

5702 ROLE OF MACROPHAGES AND RECOGNITION FACTORS IN TUMOR CELL RECOGNTION AND INHIBITION. *(E.)* McNamee, R. (Tulane U. Sch. Med., New Orleans, La.), I. Olcay, T. J. Friedmann and N. R. Di Luzio. *J. Reticuloendothel Soc* 15(6):68a-69a, 1974.

5703 CELL SURFACE MEMBRANE STUDIES OF SPONTANEOUSLY AND VIRALLY TRANSFORMED CLONED MOUSE CELLS. *(E.)* Luborsky, S. (Natl. Inst. Health, Bethesda, Md.), S. Pancake, L. C. Couvillion and P. T. Mora. *Fed Proc* [II] 33(5):1416, 1974.

5704 B AND T CELL ORIGIN LYMPHOMAS. *(E.)* Holmberg, C. A. (Sch. Vet. Med., Univ. California, Davis), J. W. Osebold and J. S. Manning. *Fed Proc* 33(3):731, 1974.

5705 MOPC 104E TUMOR SYSTEM TO SIMULATE AN ANTIBODY RESPONSE MODEL. *(E.)* Ghanta, V. K. (Univ. Alabama Med. Cent., Birmingham), N. M. Hamlin and R. N. Hiramoto. *Fed Proc* 33(3):732, 1974.

5706 CHARACTERIZATION OF ONCORNAVIRUS ISOLATED FROM NZB LYMPHOBLASTOID CELLS. II. INDUCTION OF AUTOIMMUNITY. *(E.)* Croker, B. P. (Scripps Clin. Res. Found., La Jolla, Calif.), B. C. Del Villano and F. J. Dixon. *Fed Proc* 33(3):753, 1974.

5707 ABSENCE OF SERUM BLOCKING FACTORS IN HAMSTERS WITH PROGRESSIVE SV40-INDUCED TUMORS. *(E.)* Goldrosen, M. H. (McMaster Univ., Hamilton, Canada) and P. B. Dent. *Fed Proc* 33(3):769, 1974.

5708 IMMUNE RESPONSE TO FRIEND VIRUS-INDUCED LEUKEMIA IN MICE. *(E.)* Ting, C. C. (Natl. Cancer Inst., Bethesda, Md.), G. Shiu and D. Rodrigues. *Fed Proc* 33(3):782, 1974.

5709 IDENTIFICATION AND SEPARATION OF SURFACE ANTIGENS OF RAT MOLONEY SARCOMA. *(E.)* Jones, J. M. (Scripps Clin. Res. Found., La Jolla, Calif.) and J. D. Feldman. *Fed Proc* 33(3):791, 1974.

5710 SOME CHARACTERISTICS OF SOLUBILIZED TUMOR ANTIGEN ISOLATED FROM AN RNA VIRUS-TRANSFORMED NEOPLASM. *(E.)* Chang, K. S. S. (Natl. Inst. Health, Bethesda, Md.), E. Appella and L. W. Law. *Fed Proc* 33(3):791, 1974.

5711 EARLY CHANGES IN CYCLIC AMP AND CYCLIC GMP IN ANTIBODY-STIMULATED TUMOR CELLS. *(E.)* Shearer, W. T. (Washington Univ. Sch. Med., St. Louis, Mo.), H. J. Wedner, G. W. Philpott, C. Harford and C. W. Parker. *Fed Proc* 33(3):805, 1974.

5712 SERUM- AND CELL-MEDIATED CYTOTOXICITY AGAINST AN ALLOGENEIC HUMAN MELANOMA CELL. *(E.)* Peter, H. H. (Div. Clin. Immunol., M.H.H., Hannover, West Germany), P. Seeland, V. Diehl, G. Eckert, J. R. Kalden and H. Deicher. *Fed Proc* 33(3):806, 1974.

5713 CELLULAR IMMUNITY AGAINST MURINE SARCOMA VIRUS-INDUCED TUMORS: CRYOPRESERVATION OF EFFECTOR AND TARGET CELL FUNCTIONS AS MEASURED BY THE ^{51}CR CYTOTOXICITY ASSAY. *(E.)* Holden, H. T. (Natl. Cancer Inst., Bethesda, Md.), R. K. Oldham and R. B. Herberman. *Fed Proc* 33(3):806, 1974.

5714 SYNERGISM INDUCED BY CON A OR PHA AND ENDOTOXIN IN THE BLASTOGENIC RESPONSE OF HUMAN PERIPHERAL BLOOD LYMPHOCYTES. *(E.)* Schmidtke, J. R. (Univ. Minnesota, Minneapolis) and J. S. Najarian. *Fed Proc* 33(3):793, 1974.

5715 CONCANAVALIN A INDUCED CHANGES IN CYCLIC AMP IN PURIFIED HUMAN LYMPHOCYTES. *(E.)* Lyle, L. R. (Washington Univ. Sch. Med., St. Louis, Mo.), H. R. Liebhaber and C. W. Parker. *Fed Proc* 33(3):794, 1974.

5716 *IN VITRO* LYMPHOPROLIFERATIVE RESPONSES OF MURINE SPLEEN CELLS DURING THE GROWTH OF EXPERIMENTAL TUMORS. *(E.)* Kirchner, H. (Natl. Cancer Inst., Bethesda, Md.) and M. Glaser. *Fed Proc* 33(3):805, 1974.

5717 SENSITIZED LYMPHOCYTE-TUMOR CELL INTERACTION. *(E.)* Hornung, M. O. (Tulane Univ. Sch. Med., New Orleans, La.) and E. T. Krementz. *Fed Proc* 33(3):806, 1974.

5718 IMMUNOSUPPRESSOR CELLS IN TUMOR BEARING HOSTS. *(E.)* Fujimoto, S. (Immunol. Dep., Univ. Manitoba, Winnipeg, Canada), M. Greene and A. H. Sehon. *Fed Proc* 33(3):769, 1974.

5719 REVERSAL OF NONSPECIFIC ENHANCEMENT OF TUMOR GROWTH. *(E.)* Siegel, I. (Roosevelt Hosp., New York, N.Y.) and N. P. Christy. *Fed Proc* 33(3):770, 1974.

5720 EVIDENCE FOR THE VIRAL NATURE OF AN IMMUNODEPRESSIVE FACTOR (IDF) ASSOCIATED WITH VARIOUS TRANSPLANTABLE TUMORS. *(E.)* Iorio, A. (Lab. Tumor Immun. Chem., Univ. Perugia, Italy), A. Barze, A. Bonmassar and A. Goldin. *Fed Proc* 33(3):781, 1974.

5721 DEMONSTRATION OF FELINE CI ACTIVATING CAT ANTIBODY TO THE INTERSPECIES ANTIGENIC DETERMINANT OF MAMMALIAN C-TYPE RNH-VIRUSES. *(E.)* Olsen, R. G. (Ohio State Univ., Columbus), S. Krakowka, J. P. Schaller and D. S. Yohn. *Fed Proc* 33(3):754, 1974.

5722 BLASTOGENIC TRANSFORMATION OF MURINE B CELLS BY POLYNUCLEOTIDES AND CARBOHYDRATE POLYMERS: THE INFLUENCE OF MACROPHAGES. *(E.)* Ahmed, A. (Nav. Med. Res. Inst., Bethesda, Md.), D. M. Strong and I. Scher. *Fed Proc* 33(3):645, 1974.

5723 IMMUNOLOGICAL DETECTION OF A BLADDER CANCER SPECIFIC ANTIGEN IN URINE. *(E.)* Gozzo, J. (Northeast. Univ., Boston, Mass.), M. Daley, R. Schlesinger and A. Monaco. *Fed Proc* 33(3):805, 1974.

5724 CIRCULATING ANTIBODIES REACTING WITH EPIDERMAL CELLS IN PATIENTS WITH SQUAMOUS CELL CARCINOMA OF THE LUNG. *(E.)* Dorsett, B. H. (Lenox Hill Hosp., New York, N.Y.), E. Paluch and H. L. Ioachim. *Fed Proc* 33(3):805, 1974.

5725 LYMPHOCYTE STIMULATION BY TUMOR MEMBRANE-ASSOCIATED ANTIGEN FROM HYPERNEPHROMAS. *(E.)* Hemstreet, G. P. (Duke Univ., Durham, N.C.), R. A. Bonar and H. R. Seigler. *Fed Proc* 33(3):805, 1974.

5726 SELECTIVE CYTOTOXICITY OF ANTI-RNA ANTIBODIES ON TRANSFORMED CELLS *IN VITRO*. *(E.)* Varesio, L. (Inst. Microbiol., Univ. Torino, Italy), G. Forni, D. Comino and G. Cavallo. *Fed Proc* 33(3):806, 1974.

5727 T-CELL MEDIATED CYTOTOXICITY TO MOLONEY SARCOMA IN RATS. *(E.)* Veit, B. C. (Scripps Clin. Res. Found., La Jolla, Calif.) and J. D. Feldman. *Fed Proc* 33(3):806, 1974.

5728 LYMPHOCYTE MEDIATED CYTOTOXICITY AGAINST HUMAN MELANOMA DETECTED BY THE TECHNETIUM-99m MICROASSAY. *(E.)* Gillespie, G. Y. (Univ. Kansas Med. Cent., Kansas City) and R. F. Barth. *Fed Proc* 33(3):806, 1974.

5729 SOLUBLE TUMOR ANTIGENS FROM CHEMICALLY INDUCED MURINE SARCOMAS. *(E.)* Fenoglio, C. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.) and O. Stutman. *Fed Proc* 33(3):637, 1974.

5730 A TUMOR-ASSOCIATED EMBRYONIC ANTIGEN BOUND TO H-2 IN THE PLASMA MEMBRANE. *(E.)* Gooding, L. R. (Johns Hopkins Univ., Baltimore, Md.) and M. Edidin. *Fed Proc* 33(3):791, 1974.

5731 HUMAN LEUKEMIA ANTIGENS DETECTED BY NON-HUMAN PRIMATE ANTISERA. *(E.)* Mohanakumar, T. (Duke Univ., Durham, N.C.), R. S. Metzgar, D. S. Miller, R. W. Green and D. P. Bolognesi. *Fed Proc* 33(3):792, 1974.

5732 BLOOD GROUP N-LIKE CANCER ANTIGEN INTERACTS WITH HUMAN CYTOTOXIN. *(E.)* Desai, P. R. (Evanston Hosp., Ill.) and C. F. Springer. *Fed Proc* 33(3):792, 1974.

5733 AFFINITY CHROMATOGRAPHY OF CARCINOEMBYONIC ANTIGEN (CEA). *(E.)* Turner, M. D. (Univ. Rochester Sch. Med. Dent., N.Y.) and P. Z. Allen. *Fed Proc* 33(3):792, 1974.

5734 PURIFICATION OF HODGKIN'S DISEASE-ASSOCIATED ANTIGEN. *(E.)* Eshhar, Z. (Harvard Med. Sch., Boston, Mass.) and S. E. Order. *Fed Proc* 33(3):792, 1974.

5735 CELLULAR IMMUNITY IN MICE DEVELOPING GRAFT *VERSUS* HOST REACTION ASSOCIATED TUMOURS. *(E.)* Ruddle, N. H. (Yale Univ. Med. Sch., New Haven, Conn.), M. Y. K. Armstrong and F. F. Richards. *Fed Proc* 33(3):805, 1974.

5736 IMMUNEGLOBULIN D AND IgD PLASMOCYTOMA. *(Ger.)* Fateh-Moghadam, A. (First Med. Clin. Univ., Munich, West Germany) and R. Lamerz. *Munch Med Wochenschr* 116(47):2055-2058, 1974.

5737 ABSENCE OF IMMUNOGLOBULIN A IN ANGIOSARCOMA. *(Cz.)* Sosovec, V. (Dept. Int, Dis., Hosp. Polyclin., Levoce, Czechoslovakia) and P. Hascak. *Vnitr Lek* 20(1):70-74, 1974.

5738 SOLUBILIZING CARCINOEMBRYONIC ANTIGEN (CEA) FROM A CYTOPLASMIC MEMBRANE FRACTION ISOLATE FROM CANCEROUS HUMAN GASTRIC MUCOSA. *(Fr.)* Bara, J. (Sci. Res. Inst. Cancer, Villejuif, France), S. von Kleist and P. Burtin. *Ann Immunol* [C] *(Paris)* 125(6): 939-946, 1974.

See also:

- * (Rev): 5401, 5410, 5411, 5412, 5413, 5427, 5432, 5442, 5443, 5449
- * (Chem): 5465, 5477, 5485, 5506
- * (Viral): 5548, 5597, 5598, 5599, 5607
- * (Epid-Biom): 5836

5739 THE TEMPORAL RESPONSE OF THE DYNAMIC CELL TO DISTURBANCES AND ITS POSSIBLE RELATIONSHIP TO DIFFERENTIATION AND CANCER. *(E.)* Gilbert, D. A. (South African Inst. Med. Res., Johannesburg). *S Afr J Sci* 70(8):234-244, 1974.

The temporal biochemical responses of proliferating and nonproliferating embyronic hamster fibroblasts, human erythrocytes, rat hepatoma cells, and HaK cells to a variety of disturbances were studied. In particular, the effects of iminazole, cold shock, anoxia, nicotine, and potassium chloride on the oscillatory patterns of lactate dehydrogenase, hexokinase and aldolase and on the phase relationships among these oscillations were investigated. Evidence was obtained for the existence of oscillatory changes in the effective isozyme patterns of lactate dehydrogenase and aldolase in monolayer cultures of the cells and erythrocytes. Several distinct oscillations were involved, the oscillatory periods being on the order of 0.45-2.0 hr. The hexokinase system exhibited a similar periodic activity. In what appeared to be the undisturbed state, the various activity and isozyme pattern changes were of the same frequency, different cells exhibiting apparently characteristic patterns of behavior. The oscillations persisted in the presence of all disturbing agents and under all conditions examined but they underwent complex changes in frequency, mean level, amplitude, and phasing under different conditions. Evidence was also obtained indicating the existence in some instances of discontinuous behavior in the various biochemical systems; this may indicate spontaneous metabolic switching. At times the lactate dehydrogenase oscillations appeared to be frequency modulated. Whether or not the enzyme and isozyme oscillations prove to be related to the cell's metabolic rhythms, it seems advisable to treat the cell as a multioscillator system.

740 PRIMARY RETICULUM-CELL-SARCOMA OF THE OF THE BRAIN: A CLINICAL-PATHOLOGICAL TUDY. *(E.)* Stefanko, S. (Inst. Pathol., Erasmus niv., Rotterdam, Netherlands) and D. Moffie. *Clin eurol Neurosurg* 77(2):96-109, 1974.

n anatomical-clinical description is given of 13 ases of primary reticulum-cell-sarcoma of the brain five men and eight women patients were in the 45-65 r age group). Duration of illness was 1-8 months, ith ten patients dying within four months. Mental ymptoms predominated at the beginning of the disase but the clinical-neurological picture was not pecific. While focal neurological symptoms were resent in eight cases, the neurological localizaion was confirmed at autopsy in only three. In he other five cases with focal symptoms, the tumor rocess was more diffuse than expected from clinical xamination. Tumor cells were present in cerebropinal fluid in three cases. In three patients the umor process was rather circumscribed in the white atter of the left or right temporal lobe and in he isthmus. The majority of cases showed diffuse nfiltration into the corpus callosum, corona radita, septum pellucidum, fornices, basal ganglia, uclei amygdalae, and hippocampi and also into the ortical and subcortical areas. The histologic picture is indicative of a hyperplastic-anaplastic process of the reticular system.

5741 CSF SEEDING OF INTRA-CRANIAL TUMOURS: A STUDY OF 96 CASES. *(E.)* Bryan, P. (Royal Infirm., Sheffield, England). *Clin Radiol* 25(3): 355-360, 1974.

Of 96 cases of seeding intracranial tumors, 59 (61.4%) were classified as malignant astrocytomas. This incidence of seeding astrocytomas is much higher than previously reported (7.1% of 42). Only nine cases (9.6%) were associated with medulloblastomas, which is much lower than previously reported (48.6%). Because many of the astrocytoma implants in the present series were microscopic, it is postulated that equivalent ones may have been overlooked in other series; by the same token medulloblastomas may have been more frequently detected because they produce larger seedlings. Twenty-two patients were examined by contrast radiology (Myodil venticulography, air encephalography, or myelography); in only one patient were nodular seedlings identified. In two other myelograms spinal blocks were produced by what subsequently proved to be tumor deposits. Of the 59 astrocytomas, 57 were classified as grade 4 and two grade 3 malignancy; all 15 ependymomas were grade 4. All the tumors were directly invading at least one ventricle and destroying its ependymal lining. It is suggested that direct access to cerebrospinal fluid in this way is a prerequisite for dissemination of tumor cells, and that such seeding is associated with a high degree of malignancy.

5742 MASSIVE CONGENITAL INTRACRANIAL TERATOMA. *(E.)* Vraa-Jensen, J. (Stanford Univ. Sch. Med., Calif.). *Acta Neuropathol (Berl)* 11(3):271-276, 1974.

A massive congenital benign teratoma grossly replacing the cerebral hemisphere was examined by light and electron microscopy. The tumor contained tissues derived from all three germ layers. The cerebellum showed a well-formed external granular layer and defects in the alignment of Purkinje cells, suggesting focal areas of migratory arrest. These morphological features are compatible with a developmental age equivalent to 20-25 weeks of gestation. In the present male patient, the nuclear sex of one well-differentiated tissue (squamous epithelium) in the teratoma was male. This finding does not invalidate the recently-proposed hypothesis that extragonadal teratomas, which are often congenital, could represent an included twin pregnancy. However, the present tumor can easily be interpreted by theory of disturbed embryogenesis, since it arose at a very early stage of fetal development.

5743 ULTRASTRUCTURAL STUDIES OF PITUITARY TUMORS. *(E.)* Dickmann, G. H. (Univ. Buenos Aires Sch. Med., Argentina). *Recent Prog Neurol Surg, Proc Symp Int Congr Neurol Surg, 5th, Tokyo, Oct 7-13, 1973 (Amsterdam: Excerpta Medica)* pp. 77-85, 1974.

Electron microscopy was employed to determine what would happen to the stored secretory granules in pituitary tumor cells when secretion was cut off and the cells had to dispose of the excess hormone. Pure prolactin cells were confirmed only in the Forbes-Albright syndrome. The remainder of the tumors studied contained pure somatotrophs (1/3), chromophobe cells, and mixed adenomas. The prolactin-rich cells were characterized by granules of varying size and diameter, by a typical ergastoplasm and by a characteristic lysosomal disposal mechanism. Condensing secretory material and dense deposits of phosphatase were identified in the innermost Golgi cisternae. The ingested granules appeared to become solubilized within the lysosomes, being successively degraded into membranous and then vacuolar residue. The pure somatotrophs were identifiable by the presence of a large number of dense and spherical secretory granules. The Golgi apparatus was well-defined and showed a few immature granules. The acid phosphatase distribution was similar in somatotrophs as in other pituitary cells: in vesicles in the vicinity of the Golgi complex, in the innermost Golgi cisternae and in primary lysosomes. The ingestion and disposal of excess granules by the somatotroph lysosomes was similar to that by the lysosomes in the prolactin tumor cells. The chromophobe cells contained well-developed Golgi apparatus containing deposits of acid phosphatase in the innermost portion. Primary and secondary granules were abundant and lysosomes containing recognizable secretory granules were rare. Digestion of the granular residue was apparently attended by more accumulation of concentric membranous arrays and myelin figures. Other chromophobe cells were characterized by enlarged Golgi apparatus with heavy deposits of acid phosphatase, abundant mitochondria, and abundant free and attached ribosomes. The chromophobe cells in the mixed somatotropic adenomas also contained numerous granulations. These cells appear to be self-acting as is clinically manifested in acromegaly. Electron microscopy offered the advantage of revealing the precise stage of activity of these cells, thus allowing formulation of criteria in their functional analysis.

5744 INTRASACRAL SPINAL CORD AND LIPOMA. *(E.)*

Blaauw, G. (Acad. Hosp. Dijkzigt, Erasmus Univ., Rotterdam, Netherlands). *Clin Neurol Neurosurg* 77(1):38-43, 1974.

A 37-yr-old man with a pure sacral lipoma and spinal cord fixed to the sacrum is presented. The patient had a history of micturition problems and recurrent urinary infections; he had had bilateral pes cavovarus since birth, and during the yr prior to admission had developed atrophy of the left calf. On examination, anal and bulbocavernosus reflexes could not be elicited. There was paralysis of the left calf. The bladder dilated grossly during micturition cytography. Roentgenograms showed a hemisacralization of L5 at the left side, slight scoliosis, and obliquity of the sacrum with widened sacral spinal cord. Myelography showed a large sacral cyst containing a tumor and concavity of the sacral vertebral bodies. At operation, the spinal cord terminated at the level of S2 on the right side and at S1 at the left side dorsally; ventrally the cord proceeded and was covered by dura with the formation of a cystic cavity. At the dorsal side the cord blended into a lipoma. The dural sac changed into the loose connective tissue of the lipoma. There were fibrous adhesions of the lipoma with the periopteum of the sacrum. After these were freed and the lipoma partly extirpated, the sacral roots had a more horizontal direction and the cord was slack. Histologic examination of both s.c. fat and lipoma showed identical features of a lipoma. The neurological picture remained as before operation. No improvement of micturition occurred.

5745 MALIGNANT SCHWANNOMAS OF NERVE ROOTS, UTERUS, AND EPIDIDYMIS IN MICE. *(E.)*

Stewart, H. L. (Natl. Cancer Inst., Bethesda, Md.), M. K. Deringer, T. B. Dunn and K. C. Snell. *J Natl Cancer Inst* 53(6):1749-1758, 1974.

Of 384 BRSUNT, STR, and BLCP mice (Strong substrains), 31 (8%) developed primary malignant schwannomas of the uterus, epididymis, or cranial and spinal nerve roots. Fourteen of 19 uterine tumors metastasized to lymph nodes, liver, spleen, peritoneum, and lung. The gross and pathologic features of primary, metastatic, and transplanted tumors were compared. Histologically, the tumors of the spinal and cranial nerves and those of the genital organs were similar. They were composed in part of fibrillar tissue resembling Antoni type A with interlacing bundles of elongated cells showing palisaded nuclei and containing Verocay bodies. In recipient syngeneic mice, much tumor tissue was composed of pleomorphic type cells or Antoni type B. It is evident that some uterine tumors, diagnosed in the past as reticulum cell neoplasms type A and as endometrial stromal sarcomas, fall into the category of malignant schwannoma. A possible origin for some schwannomas is the ganglia cervicalia uteri, a sympathetic plexus consisting of two bodies lying lateral to, and on each side of, the uterus and enveloped by the broad ligament.

5746 THE TRAUMATIC NEUROMA AND PROXIMAL STUMP.

(E.) Spencer, P. S. (Albert Einstein Coll. Med., New York, N.Y.). *Bull Hosp Joint Dis* 35(2):85-102, 1974.

The architecture of a normal nerve and the basis of neuroma formation are discussed together with experimental studies of neuroma formation. Lesions of peripheral nerves were produced unilaterally in the thigh region of rats and rabbits. To study the effect of chronic partial nerve constriction on the behavior of regenerating fibers, the common paroneal nerve of rats was ligated and 5 mm proximal to the ligature the nerve was crushed with forceps. Control studies were conducted on a further series of rats in which both the effect of a simple crush with forceps and the effect of nerve ligature were examined. In a second series of experiments, the rabbits and rats were transected and the distal nerve stumps avulsed. Degeneration after a traumatic injury occurred in the peritraumatic zone and therefore regeneration did not start at the site of injury but from a node of

Ranvier. In one group of experiments, regenerating erve fibers encountered a chronic partial nerve onstriction distal to the site of crush. Proximal o the constriction, axons failed to myelinate by hree weeks and became swollen with progressively ccumulating axoplasms. Persistence of the chronic onstriction induced some obstructed regenerating ibers to seek alternative routes for growth and ifferentiation. By employing perivascular connec- ive tissue, some regenerating fibers were able to enetrate the perineurial boundary and escape from the onfines of the fascicle. An abnormal extra-fascic- lar growth observed in some of these axons constitu- ed the basis of a lateral neuromatous formation. arly events subsequent to transection were similar o those following crush injuries. With time an mputation stump and neuroma underwent progressive egeneration starting distally in the neuroma and etrogressing toward the cell body. To prevent the ormation of a neuroma, it is necessary to inhibit egeneration of the injured nerve fiber. Since at- empts to poison regenerating fibers locally have een unsuccessful, attention should now be directed oward suppressing the neuron cell body which ini- iates and supports the regeneration process.

747 INVASIVE BREAST CARCINOMA WITH LOBULAR INVOLVEMENT. FREQUENCY AND LOCATION OF LO- ULAR CARCINOMA *IN SITU.* *(E.)* Anderson, J. A. Sundby Hosp., Copehnagen, Denmark). *Acta Pathol icrobiol Scand* [*A*] 82(6):719-729, 1974.

onselected mastectomy specimens from 70 women with nvasive breast carcinoma were examined for fre- uency and location of lobular carcinoma *in situ.* arcinomatous involvement of the lobules was pres- nt in 34 cases (48%). In 16 cases the lobular hanges corresponded to lobular carcinoma *in situ,* hereas the changes were classified as carcinomatous xtension in 13 cases. The type of lobular involve- ent could not be established with certainty in the emaining five cases. In the cases of lobular car- inoma *in situ,* five lesions were at the edge of the nvasive carcinoma; four were completely outside the mor areas and in seven cases the lesions were found oth at the edge and completely outside the tumor ea. The lesions were multicentric in 59% of the ses. Thirteen of the 16 presented in the upper adrants. Tumor diameter was not related to oc- rrence of lobular carcinoma *in situ* or to carci- matous extension to the lobules. On the other nd, lobular carcinoma *in situ* was most frequent highly differentiated carcinomas. A more de- iled study of this carcinoma concurrent with in- sive breast carcinoma is considered necessary.

48 STUDIES ON THE FACTORS INDUCING METASTASIS OF BREAST CANCER TO LYMPH NODE. I. LYMPH OW IN THE THORACIC WALL. *(E.)* Matsuo, S. (Oka- ma Univ. Med. Sch., Japan). *Acta Med Okayama* 28):259-270, 1974.

e Japanese Research Society for Mammary Cancer assifies regional lymph nodes of the breast into oups 1, 2 and 3 for the medial and lateral side of the mammary gland, resp., partially depending on the frequency of carcinomatous metastasis and prognosis. To determine the validity of this classification, the mode of lymph flow from the breast to the regional lymph nodes was studied using ^{198}Au colloid. Injections were carried out at five sites on 108 mammary glands removed from 56 patients with mastopathia and ten with fibroadenoma. Lymph flow through the internal mammary nodes was abundant; in particular flow to the internal mammary nodes was more abundant than that to axillary lymph nodes when ^{198}Au colloid was injected into the lower half of the breast. Therefore, it is concluded that regardless of tumor site, internal mammary glands should be classified as group 1. Lymph flow through the subclavian nodes was less than that to the axillary nodes or internal mammary nodes. The rate of lymph flow appearance on the scintogram was about 20%. Whether subclavian nodes should be classified as Group 1 or 2 should be further studied. The rate of supraclavicular node visualization was below 3%. Therefore, the supraclavicular nodes should be considered to be Group 2. When these results are applied to the current rule for handling breast cancer, discrepancy occurs in the stage number and R number.

5749 HISTOLOGY AND ULTRASTRUCTURE OF HUMAN BREAST CANCER IN ORGAN CULTURE. *(E.)* Mataska, J. (Cancer Res. Inst., Slovak Acad. Sci. Bratislava, Czechoslovakia) and J. Siracky. *Neoplasma* 21(6):685-696, 1974.

Human breast cancer tissue was successfully cultivated in organ culture in six out of eight cases. Histologically, the cultivated cells were similar to the original cancerous tissues. The outgrowth cell formations showed variations in their histologic type. At the ultrastructural level, the cultured cells exhibited more pronounced folding of the nuclear membrane, enlarged Golgi zones, and more mitochondria with inclusions than the original tumor cells. In two of the cultivated tumors, single C-type virus-like particles were observed. Due to the small number of specimens used in this study, it is concluded that comparisons with other studies reporting the discovery of virus-type particles is not possible.

5750 EVOLUTION OF CANCER OF THE COLON AND RECTUM. *(E.)* Morson, B. C. (St. Mark's Hosp., London, England). *Cancer* 34(3):845-849, 1974.

Scientific evidence in support of the polyp-cancer sequence for both isolated polyps and polyposis as they relate to rectal and colonic cancer is reviewed. Size of the polyp, histologic type, and degree of dysplasia are the most important factors in recognizing which polyps are most likely to become cancerous. The length of the precancerous phase, age distribution, genetic factors, and environmental influences are also discussed. Evidence that most, if not all, cancers of the colon and rectum have been through the polyp-cancer sequence and alternative modes of histogenesis are considered. Chronic ulcerative colitis as a predisposing cause of large bowel cancer is supported. The precancerous phase can be recognized by examination of rectal and colonic biopsies and detection of signs of epithelial dysplasia. It is suggested that precancer in colitis, like polyposis, provides a valuable clinical model for the study of the evolution of cancer in the large bowel.

5751 EARLY GASTRIC CANCER. *(Hun.)* Oshima, H. (Steglitz Surg. Clin., Free Univ. Berlin, East Germany). *Mag Onkol* 18(1):13-18, 1974.

The diagnosis, morphology and prognosis of early gastric cancer are described on the basis of observations in Japan and Europe. Early gastric cancer is understood to be a cancer infiltrating the mucosa and submucosa, but not the muscularis propria. According to Japanese classification, early gastric cancer can be protruded, elevated, flat, depressed or excavated; it can also exhibit combinations of these characteristics. Early gastric cancer was recently found not to grow progressively but to be likely to undergo metamorphoses within a relatively short time from one type to another. The prognosis of early gastric cancer is primarily determined by the depth of infiltration rather than by the size and extension of the tumor. A five-year survival rate of 92.5% in 2,364 patients was reported from Japan, which indicated the great importance of the early diagnosis of gastric cancer.

5752 SCIRRHOUS CARCINOMA OCCURRING IN THE CORPUS (BODY) OF THE STOMACH. *(E.)* Nagayo, T. (Aichi Cancer Cent., Res. Inst., Nagoya, Japan) and H. Yokoyama. *Acta Pathol Jpn* 24(6):797-814, 1974.

A total of 143 cases of scirrhous cancer originating in the body of the stomach were examined histologically. The number corresponded to 4.2% of advanced gastric cancers resected, to 28.0% of scirrhous gastric cancers, and to 19.2% of gastric cancers originating in the body of the stomach. The 143 patients with scirrhous carcinoma included 81 women and 62 men with a mean age of 50.8 yr (21-79 yr). Based on gross appearance, the scirrhous cancers were classified as giant-fold type (70) or eroded type (73). The giant-fold type was seen mainly in the mucosa of the wide walls or of the greater curvature, while the eroded type was more often found in the mucosa of the lesser curvature or its neighboring area. Histologically, most lesions (93.1%) were moderately or poorly differentiated adenocarcinomas containing few to many signet-ring cells. Mucosae in and around eroded or ulcerated lesions were always occupied entirely by cancer cells and submucosal infiltration of the cancer cells began in this area. Infiltration of cancer cells was far more widespread in the intramural layers than in the eroded mucosa, indicating that these lesions were the original site of the scirrhous cancer. The giant folds resulted from reactive hyperplasia of the gastric mucosa to the diffuse intramural fibrosis caused by infiltration of the cancer cells. The cancerous foci of 42 cases of early cancer all showed a small erosions or shallow ulcers and about two-thirds were poorly-differentiated adenocarcinomas. Scarred lesions with regenerating epithelia were found in four cases, but these changes were considered secondary in nature.

5753 PATHOLOGICAL STUDY OF PRIMARY MALIGNANCIES OF STOMACH. *(E.)* Parekh, P. R. (Nair Charitable Hosp., Bombay, India), N. R. Rajan and I. V. Shah. *J Postgrad Med* 20(3):132-136, 1974.

Gross and histological findings are presented for 35 specimens of primary gastric malignancies studied during a five-yr period; 22 of the specimens were from surgical tissue and 15 from autopsy studies. The age of the patients varied from 24-80 yr, with the majority being in the 45-55 yr group. The male to female ratio was 3:1. Gross pathology revealed ulcerative-type lesions in 60% of the specimens, followed by lesions in the form of a polypoidal mass (17.1%) or by localized thickening (17.1%). The majority of tumors (51.4%) occurred within 4 cm of the pylorus. Histologically, 40% of the specimens were adenocarcinomas with glandular differentiation and 28.6% were mucoid adenocarcinomas. The three sarcomas in this series closely mimicked carcinomas. and their true nature was evident only on histologic examination.

5754 GEOGRAPHICAL PATHOLOGY OF GASTRIC CARCINOMA. *(E.)* Kubo, T. (Fac. Med., Kyushu Univ., Fukuoka, Japan). *Acta Pathol Jpn* 24(4):465-479, 1974.

The gross and histological features of gastric carcinoma were compared in Japan, Korea, the United States, New Zealand, and Chile to determine whether the morphology of the tumor varies in different countries. The majority of tumors were found in the lower 2/3 of the stomach in all countries, therefore, there is no marked international difference in this respect. Although tumor samples from Japan and New Zealand appeared grossly similar, further investigation is needed to confirm this observation. In all countries, the predominant histological type among the older patients was the adeno-mucoid type, while the diffuse type was more common among the younger patients. An age-standardized comparison of histological type distributions showed no uniform trend with regard to histology. There were also no differences in the distribution of histological types in different regions of Japan. Differences in mortality rates in the United States, Japan, and New Zealand were not related to differences in the distribution of histological types. The results suggest that a common carcinogen may produce different histologic types of gastric carcinoma in man and that this carcinogen may be operating in different countries and at different periods in time.

5755 THE ENDOCRINE AND HISTOLOGICAL PATTERN OF A GONADOBLASTOMA WITH TERATOID ELEMENTS AND NORMAL FEMALE KARYOTYPE. *(Ger.)* Stolecke, H. (Child. Hosp., Krefeld, West Germany), W. Muller and H. A. Hienz. *Z Kinderheilkd* 117:213-222, 1974.

gonadoblastoma was diagnosed in a 13-yr-old girl
o showed rapid virilization after apparently normal
set of puberty. The diagnosis was established by
e histologic findings and results of endocrine
udies. The karyotype did not correspond to the
ual constellation in related cases; it was 44,XX.
e gonadoblastoma was on the right side, and the
iginal gonad on this side could not be identified.
e left ovary appeared macroscopically normal. The
stologic picture was primarily undifferentiated
rm cells typical for dysgerminoma. Thecoid cells
sembling fibromatous tissue and Leydig-type cells
th some similarity to those in arhenoblastoma were
so present along with well-differentiated cartila-
ous and osseous cells. Hormonal studies revealed
ormally high values for C-21-methyl precursors,
drogens, estrogens, and gonadotrophic activity. A
ght elevation of free urinary hydrocortisone was
nsidered to be caused either by a secondary adrenal
nthesis of progesterone and/or 17 α-hydroxyproges-
rone derived from tumor tissue or by altered protein
nding of hydrocortisone. After surgery hormone
els decreased to normal or subnormal values. It
thus concluded that the elevated values were the
ult of the endocrine activity of the tumor. No
nical signs of recurrence were found seven months
er surgery.

6 NUCLEAR BODIES IN HODGKIN'S DISEASE. *(E.)*

Rivas, C. (Dep. Pathol., Found. Jimenez
z, Madrid, Spain) and H. Oliva. *Pathol Eur* 9(4):
-301, 1974.

lear bodies in Hodgkin's disease were found in
l lymph node biopsies studied under the electron
roscope. The bodies were present in histiocytes,
cular endothelial cells, and lymphoid cells. Their
phology was characterized by two predominant pat-
ns: fibrillar and granular. The fibrillar bodies
urred more frequently than the granular (4:1, resp.)
were conspicuous in endothelial cells and histio-
es. The granular bodies predominanted in lymphoid
ls and were also seen in activated lymohocytes and
stoid cells (Hodgkin's cells) but not in Reed-
rnberg cells. These findings are unrelated to the
tologic type of Hodgkin's disease. Their relation-
p to tumor evolution, prognosis and etiology is
blematic. The bodies were found in the first
gnostic biopsy in all cases and in no case were
ptoms obvious more than six months before the bi-
y was taken. One patient, treated with radiother-
and chemotherapy, is well 1.5 yr after diagnosis;
others survived one and two yr, resp., after biop-
In the other cases, no follow-up data is avail-
e. No clinical evidence of virus was present.

7 PATTERNS OF LYMPH NODE INVOLVEMENT IN RE- LATION TO HYPOTHESES ABOUT THE MODES OF
EAD OF HODGKIN'S DISEASE. *(E.)*

Smithers, D. W.
val Cancer Hosp., Sutton, Surrey, England), S. C.
licrap and A. Barnes. *Cancer* 34(5):1779-1786,
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two hypotheses which have been put forward to
ount for the patterns of lymph node involvement
observed in Hodgkin's disease are reviewed. The Rosenberg-Kaplan (R-K) hypothesis suggests that this disease is spread by tumor cell transport along contiguous lymphatic channels to adjacent lymph nodes, the cells traveling predominantly against the normal direction of lymph flow. The Smithers (S) hypothesis suggest that tumor induction may take place in one lymph node after another either through the influence of circulating initiators when localization depends on the susceptibility of different lymph node groups or by tumor cell transport along lymphatics predominantly in the normal direction of lymph flow. As a working model, the R-K hypothesis is fairly satisfactory because most involvements in multiple-site disease are adjacent (81%) and contiguous (67%). Although contiguous spread seems more reasonable, it provides a less successful working model than adjacent spread. The S hypothesis, which is more open to test than the R-K hypothesis, could reasonably account for the observed pattern of lymph node involvement in Hodgkin's disease. A susceptibility hypothesis weighted to allow for partial spread in the direction of lymph flow predicts a pattern within the error limits of the observed pattern of involvement.

5758 INFANTILE DIGITAL FIBROMATOSIS: HISTOPATHOLOGICAL AND ELECTRON MICROSCOPIC STUDY WITH A REVIEW OF THE LITERATURE. *(E.)*

Iwasaki, H. (Fac. Med., Kyushu Univ. Fukuoka, Japan), M. Tsuneyoshi and M. Enjoji. *Acta Pathol Jpn* 24(6): 717-732, 1974.

Five cases (three boys and two girls) of infantile digital fibromatosis are reported. Age at onset of tumor ranged from birth to nine months. The tumors were located in the fingers of three patients and in the toes of two patients. Multiple lesions were noted in two cases. The lesions were intradermal and had a peculiar histologic pattern with intracytoplasmic inclusions. By electron microscopy, the inclusions were composed of a network of both fibrils and fine granules and had no limiting membrane. No virus-like particles could be identified in the proliferating cells. Follow-up information was available in all five cases; one child had three recurrent tumors, the last of which regressed spontaneously. It is possible that infantile digital fibromatosis represents a proliferative reaction to an unknown etiologic agent which affects cellular metabolism, resulting in formation of inclusion bodies and sometimes in spontaneous regression of the tumor.

5759 CUTANEOUS AND SUBCUTANEOUS LEIOMYOSARCOMA: A CLINICOPATHOLOGIC STUDY OF 47 PATIENTS.

(E.) Dahl, I. (Dep. Pathol. II, Univ. Gothenburg, Sweden) and L. Angervall. *Pathol Eur* 9(4):307-315, 1974.

A retrospective study of 47 patients with leiomyosarcoma of superficial (skin and s.c.) soft tissue is presented. Forty patients had a solitary tumor, which, in 19, was situated entirely or almost entirely in the corium. Two distinct growth patterns were observed: all cutaneous tumors were poorly delimited while the s.c. tumors were almost all nodular or well-circumscribed. Some 3/4 of the tumors developed in the extremities, particularly in the hip and thigh regions. Solitary leiomyosarcomas occurred most frequently in patients with a median age of 67 yr and were two times more common in males than in females. Follow-up information was obtained on 37 patients with solitary leiomyosarcomas; the follow-up period ranging from one month to 16.5 yr (mean six yr). Local recurrences developed in 15 patients, once in eight of these patients, two to four times in three, and five or more times in four. Seven of the 47 patients had multiple leiomyosarcomas; four of these patients had already been operated on for a retroperitoneal leiomyosarcoma. Fourteen patients in the whole series died with metastatic tumors. Metastases were found in the lungs (ten cases), the liver (four), skeleton (three) and peritoneum (one). Lymph node metastases were seen particularly in patients with s.c. and multiple leiomyosarcomas, and both metastases and recurrences appeared more often in patients with large tumors or tumors with a high mitotic rate. Neither metastases nor recurrences appeared in any patient initially treated by wide surgical excision; in contrast, patients treated by local excision or enucleation had a high recurrence rate and a high frequency of metastases. Thus, wide surgical excision is the preferred treatment for leiomyosarcoma in superficial soft tissue. It is further noted that leiomyosarcomas were more easily recognized in sections that had been trichrome-stained than in hematoxylin- and eosin-stained sections.

5760 HAEMATOLOGICAL ABNORMALITIES IN SIX CASES WITH THE PRELEUKEMIC STAGE FOR 5-13 YEARS.

(E.) Kamada, N. (Res. Inst. Nucl. Med. Biol., Hiroshima Univ., Japan) and H. Uchino. *Acta Haematol Jpn* 37(1):32-48, 1974.

Cytological and cytogenetic abnormalities in the preleukemia stage were studied in six patients (four women and two men, aged 26-61 yr) who developed acute monocytic leukemia or erythroleukemia after 5-13 yr treatment for nonleukemic blood dyscrasia. All cases but one had a history of atom bomb exposure. The clinical diagnosis was refractory anemia (two cases), leukopenia (two), aplastic anemia (one) and monocytosis (one). Morphological abnormalities were observed in bone marrow aspirate of four patients 1.5-10 yr prior to leukemic development; they consisted of binucleated immature granulocytes having large cytoplasms with double nuclei, bridge formation in metaphase of granulocyte precursor cells and granule-poor neutrophils. In some cases, preleukemic peripheral blood showed poikilocytosis, nucleated red cells, giant neutrophils, monocytosis, and intranuclear vacuolation of monocytes. Chromosome analysis of two cases in the preleukemic stage revelaed aberrations in the bone marrow cells; both cases had a moderate to high percentage of abnormal clones with or without marker chromosomes. It is suggested that the morphologically abnormal bone marrow cells observed in patients with prolonged blood dyscrasia could be a condition of dysplasia. Granulocytic abnormalities in these cases might be termed dysgranulopoiesis, in contrast to the dyserythropoiesis in erythroid cells. Such abnormalities may play important roles in the development of leukemia in radiation-exposed subjects.

5761 CLINICAL STUDIES ON IRON METABOLISM OF ERYTHROBALSTS IN PRELEUKEMIC STAGE.

(E.) Kimura, I. (Okayama Univ. Med. Sch., Japan), I. Takahashi and M. Sugiyama. *Acta Med Okayama* 28(3): 173-180, 1974.

The incidence of sideroblasts and the appearance of sideroblastograms was investigated in 63 cases of hypoplastic anemia (HA) and 32 cases of acute myelocytic leukemia (AML). The incidence of sideroblasts in HA and AML was 85.3 ± 11.0% and 67.8 ± 24.7%, resp. Type III sideroblast dominant HA was observed in three of the HA cases; at the time of admission one case showed reticulocytosis and two had erythroid hyperplasia in the bone marrow. One of the three cases was complicated by an atypical factor, e.g., a shift to the left in the granulocytic series, and became AML. Retrospectively, this case was diagnosed as leukemia with a hypoplastic preleukemic stage. Type III sideroblast dominant AML was noted in five of the AML cases. In three of these, low blast levels in peripheral blood and bone marrow were identical to those in low percentage leukemia. One of the three showed ringed sideroblasts and six months later had erythroleukemia in the terminal stage. In HA and AML, type III sideroblast dominance should be examined in relation to atypical HA and atypical leukemia. Changes of iron metabolism in preleukemic erythroblasts are attributable to a disturbance in erythropoiesis such as erythroid hyperplasia in bone marrow and also, in part, to a disturbance of hemoglobin synthesis.

5762 APLASTIC ANEMIA IN THE EARLY PERIOD OF ACUTE LEUKEMIA IN CHILDREN.

(E.) Rokicka-Milewska, R. (First Pediatr. Clin., Med. Acad., Warsaw, Poland) and D. Derulska. *Mater Med Pol* 6(1):24-27, 1974.

Hypoplasia of the hematopoietic system was studied in ten children who later developed acute leukemia. Over a ten yr period (1962-1971) 276 children were treated for acute leukemia and in ten children the acute leukemia was preceded by a period of marrow hypoplasia, based on the presence of anemia, leukopenia, thrombocytopenia in the peripheral blood, and a cell-poor bone marrow. No leukemic blast cells were present. The course of the disease was described in three children. The symptoms in the preleukemic period were indistinguishable from "classic" acquired marrow hypoplasia, which does not pass into leukemia; the children had no enlargement of lymph nodes, spleen, or liver. The authors observed that a rapid and beneficial effect of encorton therapy (1,2-dehydrocortisone) was an important differential sign in distinguishing the preleukemic phase from the acquired marrow hypoplasia, which shows a much weaker response to corticosteroids. Radiographic changes in the form of a transverse line of radiolucency in the region of the metaphyses of the long bones in children with marrow hypoplasia suggested that the condition was preleukemic. Acute leukemias preceded by the marrow hypoplasia were characterized by leukopenia.

5763 AGE GROUP DIFFERENCES OF TWINS WITH LEUKEMIA.

(E.) Keith, L. (Chicago Med. Sch. Univ. Health Sci., Ill.), E. R. Brown, C. Fields and R. Stepto. *Bibl Haematol* (39):1125-1135, 1973.

A survey of 71 cases (previously reported) of leukemia in twins is presented. Of the pairs reported, 46 were monozygous (MZ), 14 dizygous (DZ) and 11 cases were undetermined. Grouping the cases according to age revealed a tendency to concordance in MZ twins in the first two years of life. Such a tendency was not seen in both groups (MZ and DZ) after two years of age. The author suggest the effects of ionizing radiation, chromosomal changes, direct metastasis and conjoined fetal circulation should be examined.

5764 JUVENILE "CHRONIC GRANULOCYTIC" LEUKEMIA: A PANMYELOPATHY WITH PROMINENT MONOCYTIC INVOLVEMENT AND CIRCULATING MONOCYTE COLONY-FORMING CELLS.

(E.) Altman, A. J. (James Whitcomb Riley Hosp. Child., Indianapolis, Ind.), C. G. Palmer and R. L. Baehner. *Blood* 43(3):341-350, 1974.

Peripheral blood from two children with so-called juvenile-type (Ph^1 chromosome negative) chronic granulocytic leukemia (CGL) was found to contain cells capable of forming large numbers of exclusively monocytic colonies *in vitro.* These results are markedly different from those reported for classic adult-type (Ph^1 chromosome positive) CGL in which predominantly granulocytic colonies are produced. Spontaneously dividing peripheral blood and bone marrow cells from one patient contained a translocation between chromosome 3 and a C-group chromosome. However, phytohemagglutinin-stimulated peripheral blood cells from this patient had normal chromosome morphology. Since the translocation was present in 141/142 karyotypes from bone marrow at a time when it contained many dividing erythroid and myeloid cells, the pathologic process is not exclusively confined to the monocyte line, but involves all hematopoietic cells. These findings support the concept that juvenile CGL is neither a chronic nor a granulocytic leukemia; it is a panmyelopathy with monocyte predominance and should thus be classified as a variant of myelomonocytic leukemia.

765 IMMUNOBLASTIC ACUTE LYMPHOID LEUKEMIA.

(E.) Mathe, G. (Hosp. Paul-Brousse, illejuif, France), D. Belpomme, D. Dantchev, P. ouillart, C. Jasmin, J. L. Misset, M. Musset, J. L. miel, J. R. Schlumberger, L. Schwarzenberg, M. Hayat, . De Vassal and M. Lafleur. *Biomedicine* 20(5):333-40, 1974.

ight cases of acute lymphoid leukemia (ALL) that do not correspond to four previously described ALL types were reported with respect to histopathology and clinical course. Five of the cases studied were termed primary immunoblastic acute lymphoid leukemia because the bone marrow was invaded at the first examination. The other three cases were termed early leukemic immunoblastic lymphosarcoma since the bone marrow had not been invaded when the first lymphoid mass was detected; it was invaded a few weeks later. The types were labeled immunoblastic because light and electron microscopy revealed the leukemic cells to be typical immunoblasts. Cytochemical studies showed the cells to be lymphocytic, and immunological studies showed that they may contain T, B, or no markers. Seven of the eight patients died within two yr from gram negative septicemia, cerebral hemorrhage, or brain localizations. The authors suggest that the immunoblasts involved in these cases may have been neoplastically transformed in the thymus or after passing through it, and that the concept of the bone marrow as the origin of leukemias may be incorrect.

5766 DISTRIBUTION OF LYSOZYME IN THE SERUM, URINE AND KIDNEYS OF AKR MICE DURING THE PATHOGENESIS OF LYMPHOCYTIC LEUKEMIA: A BIOCHEMICAL, HISTOCHEMICAL AND LIGHTMICROSCOPIC STUDY.

(E.) Klockars, M. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Acta Pathol Microbiol Scand* [*A*] 82(6):665-674, 1974.

The distribution of lysozymes in the serum, urine, and kidney homogenates was studied in young (< four months) AKR mice, in old (> eight months) AKR mice bearing a spontaneous lymphocytic leukemia and in young AKR mice injected i.p. with leukemic lymphocytes (1 x 10^6). Lysozyme concentrations in kidney homogenates of old mice were significantly higher than in those of young mice (212 *versus* 75 µg/g wet weight). However, after the injection of leukemic cells into young mice, the concentration of lysozyme in the kidney homogenates rose significantly to 128 µg/g by day 11. Not until 11 days after transplantation of leukemic cells was lysozyme detected in the urine; the maximum level of lysozymuria (80 µg/ml) was reached on day 14. Serum lysozyme concentrations did not vary markedly in either age group or during the course of leukemic cell proliferation. During the pathogenesis of the transplanted leukemia, morphological changes were observed within the proximal tubular cells of the kidneys by light microscopy and by the cytochemical demonstration of lysozyme with an immunoperoxidase technique. The number and size of dense and lysozyme-positive granules of the proximal tubular cells increased concomitantly with the increase in lysozyme levels in kidney homogenates. By the time of maximum lysozymuric concentration, marked tubular cell damage was apparent. Enlarged vacuoles had formed within a number of cells; areas of tubular necrosis were visible and leukemic infiltrates were abundant around the small blood vessels. The elevated lysozyme levels in leukemic mice are discussed as a phenomenon related to the stimulation of the reticuloendothelial system induced either by the injected leukemic cells or by the viral agent associated with this lymphocytic leukemia.

5767 HEPATOCELLULAR CARCINOMA AND PARTIAL DEFICIENCY OF ALPHA-1 ANTITRYPSIN (MZ). *(E.)* Rawlings, W., Jr. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.), J. Moss, H. S. Cooper and S. R. Hamilton. *Ann Intern Med* 81(6):771-773, 1974.

Case reports were presented of two men (66 and 64 yr) with cryptogenic liver disease and alpha-1-antitrypsin deficiency of the MZ phenotype; both patients were found to have hepatocellular carcinoma at autopsy examination. The first patient was admitted with ascites, hepatomegaly, and dependent edema; alpha-1 antitrypsin of an MZ phenotypic pattern was identified by electrophoresis. The patient died after massive upper gastrointestinal bleeding terminated by multiorganism sepsis; autopsy showed a severe macronodular cirrhosis with a multifocal hepatocellular carcinoma. The second patient was admitted with acute upper gastrointestinal bleeding; examination revealed scleral icterus, hepatomegaly and slight edema. Alpha-fetoprotein was negative; the patient died of uncontrollable upper gastrointestinal bleeding with rapid deterioration of hepatic function. Alpha-1 antitrypsin of an MZ phenotype was found by crossed immunoelectrophoresis at autopsy examination as well as a large hepatocellular carcinoma of the left liver lobe. Association of hepatocellular carcinoma and alpha-1 antitrypsin deficiency of the MZ phenotype in patients with cryptogenic liver disease may or may not be a chance occurrence.

5768 THE CYTOLOGY OF CARCINOMA OF THE LUNG: RESULTS OF TUMOR CELL TYPING OVER 10 YEARS. *(E.)* Healy, T. M. (Dep. Pathol., Univ. Coll., Dublin, Ireland). *Cancer Cytol* 14(2):27-29, 1974.

Tumor cell types found on cytology of the sputum are presented for 482 patients (418 men and 64 women) with primary carcinoma of the lung. Although 80.9% of the patients were inoperable, the predominant tumor type was squamous carcinoma (73%). Oat cell tumors accounted for 13.3% of the cases, undifferentiated large cell tumors for 7.5% and adenocarcinomas for 3.8%; 2.5% of the tumors were of uncertain cell type. Of the 121 surgical cases, 25% had negative biopsies at bronchoscopy and yet had cancer cells in their sputum. The relationship to smoking was highest (94% smoked) for squamous carcinoma and lowest (63%) for adenocarcinoma. The frequency of squamous carcinoma in the present series is much higher than in 22 different series in which the incidence of squamous cells in sputum varied from 29-64% (mean 47%). In this series the diagnosis was confirmed histologically in 72% of the cases.

5769 GRANULAR CELL MYOBLASTOMA OF THE LARYNX. *(E.)* Thawley, S. E. (Wash. Univ. Sch. Med., St. Louis, Mo.), M. May and J. H. Ogura. *Laryngoscope* 84(9):1545-1551, 1974.

Six cases of granular cell myoblastoma of the larynx over a 15 yr period are reported. The lesions occurred more in females (five to one) in the fourth and fifth decades. Most were symptomatic with hoarseness. Half (three) of the lesions were located on the posterior true vocal cord, two on the mid cord and one on the anterior cord, and all were removed endoscopically. Follow-up of six months to six yr has revealed no recurrences. Microscopically the lesions consisted of pink cells with the characteristic granules. A problem in diagnosis was the frequently present overlying epithelial layer of pseudoepitheliomatous hyperplasia which must not be mistaken for carcinoma; the lesions were benign. Although a few malignant cases have been reported, there have been none in the larynx. Endoscopic local excision is usually adequate, although very large lesions may require laryngofissure or hemilaryngectomy. Even total laryngectomies have been reported. It has been suggested that the lesion is not a tumor at all, but may be a reaction to trauma, inflammation or viral infection. The most popular and probably correct hypothesis is that the tumor arises from Schwann cells. The evidence is supported by electron microscopy studies and the specific mechanism is postulated to be a focal lysozymal defect of the Schwann cells. A better name for this lesion may be granular cell Schwannoma.

5770 LEVELS OF LEUKOPOIETIN ACTIVITY IN PATIENTS WITH MYELOFIBROSIS. *(E.)* Bierman, H. R. (Inst. Cancer Blood Res., Beverly Hills, Calif.) and J. E. Hood. *Bibl Haematol* (39):890-896, 1973.

Plasma samples from seven myelofibrosis patients were injected i.p. into C57Bl mice in order to determine the effects of myelofibrotic plasma on granulopoiesis and DNA synthesis in bone marrow. All myelofibrosis plasma samples stimulated granulopoiesis, in comparison with control normal plasma samples. DNA synthesis was also increased when estimated autoradiographically following ^{3}H-thymidine injection. Immature granulocytes were increased in number 6-12 hr following plasma injection, and six hr later there was an increase in the number of mature granulocytes. No stimulation of lymphocytic, megakaryocytic or erythroid elements was observed. It is concluded that plasma obtained from myelofibrosis patients contains a specific granulopoiesis stimulating factor, that causes enhanced, normal granulocytic development. It is also suggested that the stimulating factor is leukopoietin.

5771 MALIGNANT MELANOMA IN JAPAN. *(E.)* Takahashi, M. (Tohoku Univ. Sch. Med., Sendai, Japan) and M. Seiji. *Jpn J Clin Oncol* 6(4):33-46, 1974.

The treatment and diagnosis in Japan of three cases of specific types of melanoma: subungual melanoma, lentigo maligna melanoma on the sole of the foot and amelanotic nodular melanoma of the gingiva) are described. In the first case (subungual melanoma), a 49 yr old farmer had brown black longitudinal streaks on the right first fingernail for ten yr. The pigmented stripes gradually widened and the nail became entirely black. The nail was extracted, grew back, and was again extracted. The nail bed turned

into a shallow ulcer. A major amputation at the
middle of the upper arm followed by a radical lymph
node dissection of the axilla was performed. The
histopathological section through the ulcerated area
revealed a malignant melanoma of spindle shape cell
type which reached the bone marrow. Post-operative
treatments of 4100 rad were given. A 46 yr old man
had a growth on the lateral aspect of the right heel
for 2.5 yr. A raised, verrucous pigmented nodule
was present and there were irregular pigmented freck-
les. A wide local excision of the mass combined
with discontinuous regional lymph node dissection
of the right inguinal and femoral regions was car-
ried out, followed by skin grafting. A microscopic
lymph node metastasis was recognized. After the
operation, the patient received 100 g of hydroxy-
rea. The patient remained free of melanoma for
en months; he then developed several small black
apules in the femoral area. The patient died 13
onths after the operation. The case illustrates
he significant point that the pigment freckles
eveloped first, and then melanoma followed. A 74
r old woman suffered from non-pigmented gingival
welling of the right upper second and third molar
eeth diagnosed as a non-pigmented malignant mel-
noma. A partial removal of the maxilla and a rad-
cal dissection of the cervical lymph nodes was per-
ormed. It is concluded that the most effective
reatment for malignant melanoma at present is sur-
ical excision.

772 A CASE OF MULTIPLE MYELOMA TERMINATING WITH ACUTE MYELOMONOCYTIC LEUKEMIA AFTER LONG-
ERM MELPHALEN THERAPY.

(E.) Ohta, H. (Nagoya
niv. Sch. Med., Japan), Y. Ikeda, T. Shibata and N.
irabayashi. *Acta Haematol Jpn* 37(1):49-57, 1974.

cute myelomonocytic leukemia is reported as a ter-
inal complication in multiple myeloma patients
eated with melphalan. One patient's past history
cluded r-nephrectomy, serum hepatitis, ureto-
thotomy and r-orchiectomy. In 1967 he was found
have serum M component but no overt symptoms of
eloma or skeletal change. Thirty months later he
veloped severe bone pain and diagnosis of multiple
eloma was established by demonstration of marked
rum M-protein (IgG, Λ, 6.5 g/100 ml), plasma cell
oliferation, and lytic bone lesion. He responded
ll to melphalan (initially 10 mg/day) with de-
ease of pain, M-protein, and plasma cells; and
d well on continuous low-dose melphalan therapy
otal 1040 mg) for 23 months. In 1972, melphalen
s discontinued because of bone marrow suppression
d peripheral pancytopenia. Seven months later,
llowing a gradual increase of monocytes in peri-
eral blood, acute leukemia developed with bone
rrow being replaced by blasts showing chromosomal
normality [hypodiploidy (C-1) and Ph_1 positivity].
e patient died in 1972, and postmortem examination
nfirmed leukemia infiltration of the bone marrow,
leen, and lymph nodes with some residual evidence
myeloma. This is the 26th reported case of a
eloma patient who developed acute myelocytic or
elomonocytic leukemia after responding to melphal-
. The drug may be implicated in these complica-
ons.

5773 MYELOMA CELLS IN THE CEREBROSPINAL FLUID IN PLASMA CELL NEOPLASIA.

(E.) Afifi, A. M. (No affiliation). *J Neurol Neurosurg Psychiatry* 37(10):1162-1165, 1974.

Two cases of plasma cell neoplasia in which myeloma cells were found in the cerebrospinal fluid are described. Both patients, a 48-yr-old man and a 45-yr-old man, were included in a myelographic study of 38 patients in whom myeloma was associated with extensive neurological complications. The myeloma cells were looked for in Wright stained centrifuged deposits of 2-5 ml cerebrospinal fluid samples obtained during myelography. The possibility that occult traumatic lumbar puncture had allowed entry of circulating myeloma cells from the peripheral blood into the subarachnoid space was excluded by the absence of myeloma cells in smears of the peripheral blood and its buffy coat. Up to the later stages of the disease the meningeal myeloma lesions remained microscopic and no signs of raised intracranial tension were manifested by either patient. Meningeal myeloma is presumed to develop as a result of neoplastic proliferation into the myeloma cells of the totipotent mesenchymal cells accompanying the pial blood vessels. Another possible mechanism is the invasion of the dura mater by epidural myelomas which seed myeloma cells in the subarachnoid space. The available clinical evidence suggests that meningeal myeloma differs from meningeal leukemia in its incidence, clinical manifestations, and microscopic appearance.

5774 GENETIC STUDY OF RETINOBLASTOMA.

(Fr.) Briard-Guillemot, M. L. (Hosp. Sick Child., Paris, France), C. Bonaiti-Pellie, J. Feingold and J. Frezal. *Humangenetik* 24(4):271-284, 1974.

A study was made of 598 cases of retinoblastoma, of which 10.5% were familial and 36.0% were bilateral. In cases of retinoblastoma in two or more siblings or in a parent and a child, 65.3% of the familial cases were bilateral. In familial cases involving more distant relationships, the older patients had unilateral involvement in all cases, and the younger patients had bilateral and unilateral involvement with equal frequency. In spontaneous cases of unilateral and bilateral involvement, resp., the frequency of retinoblastoma in younger siblings was 0.6% and 6.2%. In familial cases, the frequency of either type of involvement in younger siblings was 27%. In spontaneous cases of bilateral retinoblastoma, the frequency of the disease in the children was 55.5%, but only 1.2% for the children of patients with unilateral involvement. This indicates that all bilateral cases are hereditary and caused by a dominant mutation of an autosome. Study of the genealogies revealed 46 carriers in 27 of the 40 families in which more than one person had the disease. Of their offspring, 30.3% had the disease, half bilaterally and half unilaterally; another 11.5% were themselves carriers. Thus, penetrance of the unilateral form is not complete. It is calculated at 69% for descendants of unilaterally afflicted patients and at 72% for descendants of carriers. A mechanism of transmission to account for this is proposed: premutation consisting of simple autosomal breakage, susceptible to repair. The breakage may eventually result in deletion, at which point the mutation acquires complete penetrance. If deletion occurs at the time of the original mutation, the disease is immediately hereditary. The rate of mutation is calculated at about 5 x 10^{-6}.

5775 NON-EPITHELIAL THYROID NEOPLASMS TREATED AT THE INSTITUTE OF ONCOLOGY IN WARSAW BETWEEN 1947-1966. *(Pol.)* Nowak, G. (Inst. Oncol., Warsaw, Poland) and B. Bakowska. *Nowotwory* 24(3): 187-190, 1974.

Results of treating ten patients with primary non-epithelial thyroid neoplasms (4% of all malignant thyroid neoplasms treated between 1947-1966 at the Oncology Institute in Warsaw) are presented. They include four cases of angiosarcoma, all in men aged 28-46 yr; five cases of lymphosarcoma, all in women aged 25-64 yr; and one case of myeloma in a 47-yr-old woman. Symptoms lasted 1.5-9 months in three cases and five yr in one case of angiosarcoma, 3-6 months in the women with lymphosarcoma and 3 yr in the patient with myeloma. All underwent radiation therapy (one or two fields, 4,000-5,000 r) and seven patients had non-radical surgery. A ten and 20 yr survival was achieved in two of four patients with angiosarcoma; the other two died six and 14 months later. Local regression was achieved in patients with lymphosarcoma but all died 3-13 months after therapy. The patient with myeloma is alive and asymptomatic ten yr later.

5776 MICROANGIOGRAPHIC STUDY OF WALKER 256 CARCINOSARCOMA IN RAT KIDNEY. *(E.)* Oikawa, M. (Iwate Med. Univ., Morioka, Japan). *Tohoku J Exp Med* 113(2):135-140, 1974.

Walker 256 carcinoma grew well in nearly all Sprague-Dawley rats injected directly in the left kidney with 10,000 tumor cells. After transplantation, microangiography was performed using 0.2-0.3 ml of Micropaque as a contrast medium which was injected through a PE-50 polyethylene catheter in the left renal artery. The angiographic characteristics of the transplanted carcinoma were: (1) peculiar dilation and tortuosity of the regional branch vessels to the tumors and (2) formation of a complete network by many small vessels derived from the main branches. The network covered the entire surface of each tumor. In a few advanced tumors, characteristic features of tumor vessels were gradually lost and foci of avascularization appeared at the center or periphery of the tumor masses.

5777 ELECTRON MICROSCOPIC STUDIES OF XERODERMA PIGMENTOSUM: UNUSUAL CHANGES IN THE KERATINOCYTE. *(E.)* Tsuji, T. (Osaka Univ. Sch. Med., Japan). *Brit J Dermatol* 91(6):657-666, 1974.

Sixteen biopsy specimens taken from five patients with typical xeroderma pigmentosum were examined using the electron microscope. The ultrastructural changes seen were usually similar to those reported previously, however two of the 16 specimens studied demonstrated unusual features such as: clear cytoplasmic areas of varying shapes and sizes, clear areas filled with a fine granular substance; dilatation of the rough endoplasmic reticulum; multilobular, indented nuclei; and symmetrically cross-banded fibrils contained within the dilated rough endoplasmic reticulum. Since the basic disability of xeroderma pigmentosum is a marked sensitivity to sunlight, the author postulates that the unusual changes are either due to solar irradiation or have some relationship with carcinogenesis.

5778 ELECTRON MICROPROBE ANALYSIS OF PSAMMOMA BODIES IN THYROIDS. *(E.)* Van Middlesworth, L. (Univ. Tennessee Med. Units, Memphis), W. L. Robinson and A. L. Vickery, Jr. *Fred Proc* 33 (3):250, 1974.

5779 ULTASTRUCTURAL STUDIES ON THE HISTOGENESIS OF EMBRYONAL CARCINOMA OF THE OVARY. *(E.)* Kawase, N. (Sapporo Med. Coll., Japan), M. Fukushima, T. Seto and M. Hashimoto. *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3/4):328-329, 1974.

5780 ELECTRON MICROSCOPIC OBSERVATIONS ON NASAL PAPILLOMA. *(E.)* Miyahara, H. (Osaka Univ. Fac. Med., Japan)and M. Osaki. *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3/4):444-445, 1974.

5781 ELECTRON MICROSCOPIC OBSERVATION ON SYNOVIAL SARCOMA OF POORLY DIFFERENTIATED TYPE. *(E.)* Yoko, Y. (Chiba Cancer Cent. Res. Inst., Japan), T. Noboru, H. Eiji and S. Yoko. *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3/4):307-308, 1974.

5782 CRYSTALLOID STRUCTURE REVEALED IN THE PROXIMAL TUBULE CELLS OF MYELOMA KIDNEY. *(E.)* Fujibayashi, T. (Cent. Adult Dis., Osaka, Japan) and R. Fujii. *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3/4):255, 1974.

5783 ULTRASTRUCTURE AND DIFFERENTIATION IN RETINOBLASTOMA AND EMBRYONAL RHABDOMYOSARCOMA OF THE ORBIT. *(E.)* Amemiya, T. (Fac. Med., Kyoto Univ., Japan) and M. Ohkuma. *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3/4):261-262, 1974.

5784 ELECTRON MICROSCOPIC STUDIES OF CARTILAGINOUS TUMOR. *(E.)* Takagi, K. (Kumamoto Univ. Med. Sch., Japan). *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3/4):263-264, 1974.

5785 ULTRASTRUCTURAL AND HISTOPATHOLOGICAL STUDY ON SQUAMOUS CELL CARCINOMAS, WITH SPECIAL REFERENCE TO THE DEDIFFERENTIATION OF TUMOR CELLS. *(E.)* Kinoshita, K. (Yamaguchi Sch. Med., Ube, Japan) and H. Fujita. *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3/4):265-266, 1974.

'86 ELECTRON MICROSCOPIC STUDIES OF SQUAMOUS CELL
CARCINOMA OF THE HEAD AND NECK REGION--RELATION-
IP BETWEEN BIOLOGICAL ACTIVITY AND HISTOGENESIS. *(E.)*
tsumura, Y. (Kyushu Natl. Cancer Cent. Hosp., Fukuo-
, Japan), Y. Kurita and A. Horie. *Nihon Rynsho Den-*
i Kenbikyo Gakkai-Shi 7(3/4):267-268, 1974.

87 ELECTRON MICORSCOPIC OBSERVATIONS OF THE HU-
MAN PITUITARY ADENOMA (ACIDOPHILIC ADENOMA).
.) Kodama, Y. (Hiroshima Univ. Sch. Med., Japan),
Iguchi, S. Ishikawa and H. Fujita. *Nihon Rynsho*
ıshi Kenbikyo Gakkai-Shi 7(3/4):296-297, 1974.

38 ULTRASTRUCTURAL FEATURES OF PAPILLOMATOSIS
AND CARCINOMA OF NIPPLE DUCTS. THE SIGNIFI-
ICE OF MYOEPITHELIAL CELLS AND BASAL LAMINA IN BE-
IN, "QUESTIONABLE," AND MALIGNANT LESIONS. *(E.)*
ıld, V. E. (No affiliation) and R. W. Snyder. *Pathol*
ıu 9:441-469, 1974.

39 MEDULLARY CARCINOMA OF THE THYROID GLAND.
(E.) Ibanez, M. L. (No affiliation).
hol Annu 9:263-290, 1974.

0 EXPERIMENTAL METHODS--ORGAN CULTURE. *(E.)*
Rajan, K. T. (Llandough Hosp., Penarth, UK)
P. H. Evans. *Bio Eff Asbestos, Proc Work Conf,*
2 Edited by P. Bogovski, V. Timbrell, J. C. Gil-
, J. C. Wagner. Lyon, France, International Agency
Research on Cancer, 1973, pp. 94-98.

1 MESOTHELIOMA IN RELATION TO EXPOSURE. *(E.)*
Pooley, F. D. (Dept. Miner. Exploit., Univ.
lege, Cardiff, Wales). *Bio Eff Asbestos, Proc Work*
f, 1972 Edited by P. Bogovski, V. Timbrell, J. C.
son, J. C. Wagner. Lyon, France, International
ıcy for Research on Cancer, 1973, pp. 222-225.

2 ELECTRON MICROSCOPY OF NORMAL, HYPERPLASTIC
AND NEOPLASTIC MESOTHELIUM. *(E.)* Suzuki,
(Mt. Sinai Sch. Med., New York, N.Y.), M. Kanner-
in and J. Churg. *Bio Eff Asbestos, Proc Work Conf,*
2 Edited by P. Bogovski, V. Timbrell, J. C. Gilson,
. Wagner. Lyon, France, International Agency for
arch on Cancer, 1973, pp. 74-79.

SEBACEOUS ADENOMA. *(E.)* Baker, T. E.
(Letterman Army Med. Cent., Presidio of San
cisco, Calif.), R. B. Odom, K. C. Cummings and P.
son. *Bull Assoc Mil Dermatol* 22(2):36-38, 1974.

FINE STRUCTURE OF EXPERIMENTAL GASTRIC TU-
MOR IN RAT. *(E.)* Nishi, K. (Toneyama Hosp.,
n) and K. Tamura. *J Electron Micros (Tokyo)* 23
214, 1974.

METASTASIS OF MELANOMAS. *(Ger.)* Nivinska-
ja, M. (No affiliation). *Ideen Exakten Wissens*
31-33, 1974.

5796 ULTRASTRUCTURE OF "MALIGNANT MENINGIOMA." *(Ger.)* Matakas, F. (Steglitz Clin., Berlin, Germany) and J. Cervos-Navarro. *Verh Dtsch Ges Pathol* 57:418, 1973.

5797 CANCERS AND PRECANCEROUS STATES OF THE ORAL MUCOUS MEMBRANE AND OF THE FACIAL SKIN. *(Pol.)* Hattowska, H. (Dep. Oncol., Special Ambulatory, Warsaw-Srodmiescie, Poland) and R. K. Zielinska. *Wiad Lek* 27(8):701-704, 1974.

5798 SOLITARY EXTRAMEDULLARY PLASMACYTOMAS IN THE EAR, NOSE AND THROAT. (SOME FRESH ANATOMO-CLINICAL ASPECTS ARISING FROM A LARYNX CASE). *(It.)* Piragine, F. (Inst. Clin. Otorhinolaryngol., Univ. Parma, Italy). *Ateneo Parmense [Acta Biomed]* 45(3): 131-144, 1974.

5799 HISTOPATHOLOGICAL COMPARATIVE STUDIES OF BRONCHIAL MUCOSAL EPITHELIUM IN LUNG CANCER AND NON-LUNG CANCER CASES. *(Jpn.)* Furukawa, M. (Tokyo Med. Coll., Japan). *Tokyo Ika Daigaku Zasshi* 32(4): 757-774, 1974.

5800 STUDY OF β-GLUCURONIDASE IN PATIENT WITH CARCINOMA OF UTERINE CERVIX. *(Jpn.)* Sagawa, S. (Tokyo Med. Coll., Japan). *Tokyo Ika Daigaku Zasshi* 32(3):583-601, 1974.

5801 URINARY TRACT TUMORS IN ENDEMIC NEPHROPATHY. *(Bul.)* Atanasov, N. (Cent. Nefrol. Urol. Hemodial. Transplant. Sofia, Bulgaria), L. Donovski and Kh. Kumanov. *Khirurgiia (Sofia)* 27(3):202-206, 1974.

5802 MORPHOLOGICAL FEATURES OF COLONIC POLYPOSIS. *(Ger.)* Jansen, H. H. (Pathol. Inst., Munic. Hosp., Darmstadt, W. Germany). *Leber Magen Darm* 4(3):122-124, 1974.

5803 OBSERVATIONS ON LEUKOCYTE ALKALINE PHOSPHATASE ACTIVITY IN CHILDREN WITH ACUTE LEUKEMIA. *(Rum.)* Rautu, I. (Inst. Med. Pharm., Iasi, Rumania), A. Bratianu and M. Burdea. *Rev Med Chir Soc Med Nat Iasi* 78(1):65-68, 1974.

5804 A CASE OF "MUCOUS" ADENOCARCINOMA OF THE NOSE: HISTOLOGICAL AND HISTOCHEMICAL STUDY. *(It.)* Cimino, A. (Otorhinolaryngol. Clin., Univ. Palermo, Italy), S. Restivo and G. Cupido. *Il Valsalva* 50(3):123-132, 1974.

5805 CURRENT PROBLEMS IN CERVICAL CARCINOMA. 2. CYTOLOGY. *(Ger.)* Eschbach, W. (Cent. Inst. Cancer Res., Robert Rossle Clin., Berlin, E. Germany) and U. Bergmann. *Dtsch Gesundheitswes* 29(49):2305-2313, 1974.

5806 POLYPS IN THE UPPER GASTROINTESTINAL TRACT: THE VALUE OF ROUTINE ENDOSCOPY IN THEIR DIFFERENTIAL DIAGNOSIS AND TREATMENT. *(Ger.)* Oltmanns, D. (Med. Coll., Lubeck, W. Germany) and J. Krautheim. *Med Klin* 69(43):1749-1755, 1974.

5807 SOLITARY POLYPS OF THE RECTUM: A PRECANCEROUS CONDITION? *(Ger.)* Junemann, A. (Surg. Clin., Univ. Dusseldorf, W. Germany), R. Sailer and U. Schacht. *Med Klin* 69(43):1745-1748, 1974.

5808 TROPHOBLASTIC MONITORING TUMOR DEVELOPMENT BY DETERMINATION OF PLACENTAL LACTOGEN. *(Fr.)* Ezes, H. (Jean Godinot Inst., Reims, France), P. Wahl, G. Robinet, C. Quereux and F. Chaste. *Gynecologie* 25(4):359-363, 1974.

5809 PRIMARY HEPATIC MESENCHYMOMA: ULTRASTRUCTURAL STUDY. *(Fr.)* Lagace, R. (Hotel Dieu, Quebec, Canada), C. Delage and J. Robert. *Ann Anat Pathol (Paris)* 19(3):275-286, 1974.

5810 BASEDOW'S DISEASE AND CANCER OF THE THYROID. *(Sp.)* Granado, A. (La Paz Hosp., Madrid, Spain) J. M. Granado, J. A. Lavalle, Nistal and J. I. Jaraba. *Cir Esp* 28(4):347-354, 1974.

5811 RECURRENT TUMOR OF THE GREATER OMENTUM SUCCESSFULLY REMOVED ABOUT NINE YEARS AFTER RESECTION OF A HEPATOMA. *(Jpn.)* Konno, T. (Ooita-Ishikairitsu Hosp., Ooita, Japan), T. Arita, A. Kimura, K. Abe. *Gan No Rinsho* 20(11):992-998, 1974.

5812 BRONCHIOLOALVEOLAR CELL CARCINOMA: REPORTS OF FOUR CASES AND REVIEW OF THE LITERATURE. *(Jpn.)* Goto, A. (Sch. Med., Kagoshima Univ., Japan), H. Sone and Y. Sato. *Gan No Rinsho* 20(11):971-981, 1974.

5813 THE RESULTS OF BIOLOGICAL TESTS IN THREE PATIENTS WITH MEDULLARY CARCINOMAS OF THE THYROID. *(Fr.)* Schaison, G. (Pitie Salpetriere Univ. Hosp. Cent., Paris, France), C. Nathan and Gilbert-Dreyfus. *Ann Endocrinol (Paris)* 35(3):291-293, 1974.

5814 SARCOMAS ASSOCIATED WITH FIBROUS DYSPLASIA OF THE BONE: A COMPLEX HEMIMELIC FORM AND LITERATURE REVIEW. *(Fr.)* Abelanet, R. (Cochin Hosp., Paris, France), M. Forest, R. Meary, A. Languepin and B. Tomeno. *Bull Cancer (Paris)* 61(4):443-456, 1974.

5815 MESENCHYMAL CHONDROSARCOMA: HISTOLOGICAL AND ULTRASTRUCTURAL STUDY. *(Fr.)* Mandalenakis, N. (Sacre Coeur Hosp., Montreal, Canada). *Ann Anat Pathol (Paris)* 19(2):175-188, 1974.

See also:

* (Rev): 5401, 5413, 5414, 5415, 5416, 5421, 5424, 5425, 5428, 5441, 5446, 5448
* (Chem): 5463, 5464, 5466, 5469, 5470, 5475, 5479, 5480, 5501, 5503, 5514
* (Phys): 5528, 5529
* (Viral): 5532, 5548, 5569, 5608
* (Immun): 5623, 5627
* (Epid-Biom): 5825, 5843, 5853

5816 DIET AND MORTALITY FROM MALIGNANT DISEASE IN 32 COUNTRIES. *(E.)* Shennan, D. H. (No affiliation) and O. S. Bishop. *West Indian Med J* 23(1):44-53, 1974.

The relationship between diet and mortality from malignant diseases was investigated in 32 countries. Data on the consumption of different types of food published by the United Nations Food and Agriculture Organization were correlated with World Health Organization data relating to deaths from carcinomas, sarcomas, lymphomas, and blood dyscrasias. The results showed three types of relationships between diet and cancer. Carcinomas of the nose and nasal sinuses were associated with deficiencies of all the main colorie-rich food types. Carcinomas of the upper alimentary tract, larynx, uterine body, thyroid, and liver were unrelated to dietary factors. All other malignant disease groups were correlated with the intake of one or more calorie-rich foods. Leukemia, lymphosarcoma, multiple myeloma, Hodgkin's disease and rectal, bronchial, testicular, ovarian, renal, intestinal, cervical, pancreatic, breast, prostatic, and vesical carcinomas were positively correlated with fat and oil consumption. Breast cancer, lymphosarcoma, skin carcinomas, and tumors of the brain and nervous system were positively correlated with the intake of sugar, sweets, and/or total calories. The correlations between dietary factors and malignant diseases were considerably higher than the correlations between malignancy and infant mortality, percentage of the population engaged in agriculture, newsprint consumption, and gross national product. The results suggest that the sophisticated diet may serve as a vector for carcinogens of many different types which produce a variety of tumors and such a diet may facilitate the production of malignant disease in many tissues.

817 MORTALITY DUE TO MALIGNANT NEOPLASMS OF THE UPPER DIGESTIVE AND UPPER RESPIRATORY TRACTS MONG POLISH EMIGRANTS. *(Pol.)* Staszewski, J. (Inst. ncol., Gliwice, Poland). *Pol Tyg Lek* 29(50):2190-194, 1974.

ortality due to malignancies of the oral cavity, hroat, esophagus and larynx in 1950 and 1959-61 were ompared among Polish emigrants to the US, native mericans and Poles in Poland. Among men the mortality (per 100,000 population) from cancer in the oral avity and throat was higher in emigrants in 1950 5.1) than 1959-61 (4.2) when it was similar to that mong native Americans (4.6) but higher than in oland (figures not quoted). Among women the mortality was 1, 1, and 1.3, resp. For cancer of the sophagus the mortality among men was 10.7, 6.1 and 1, resp. and among women, 1.1, 1.4 and 0.7, resp. hese mortalities were also higher than in Poland figures not quoted). The mortality for cancer of e larynx among men was 3.6, 2.9 and 2.0, resp., and ong women, 0.1, 0.2 and 0.2, resp. These were also gher than in Poland. It is suggested that the gher mortality rate in 1950 among earlier immigrants uld be due to the fact that most of them came iginally from rural areas and had lower resistance carcinogens present in urban areas where they ually settled. They also had a more difficult time in assimilating. However, later emigrants came mostly from urban areas in Poland, from a higher socioeconomic class, were better educated, adjusted more readily to the new environment and probably consumed less alcohol and smoked less.

5818 RESULTS OF CANCER SCREENING EXAMINATIONS IN 1000 EMPLOYED WOMEN IN ST. GALLEN CANTON. *(Ger.)* Heyden, S. (Dep. Prev. Med., Dep. Hyg., St. Gallen, Switzerland), R. Amgwerd, F. Gloor, R. Wild, E. Bruderer and B. Metzler. *Schweiz Med Wochenschr* 104(43):1525-1529, 1974.

A screening program was conducted for mammary tumors (malignant and benign) in the canton of St. Gallen in eight department stores and factories. One thousand women, with an average age of 40 yr, were examined. Of these, 734 showed no pathological findings, 156 showed pathological findings, and 110 showed small solitary superficial cysts. The pathological findings included fibrosis with accumulation of fat, cystic fibrotic mastopathy, lipoma, and fibroma. Seven cases of precancerous lesions were seen. Of these, one woman had an intraductal papilloma and six had cystic mastitis accompanied by proliferative growth. There were three women who had undergone mastectomy for cancer and one woman who had a 1.5 cm diameter cancerous lesion. Out of the 1000 women, 663 had never been examined for mammary tumors, 187 had been examined over a year previously, and 150 had had an examination within the last year. Whereas 809 women were considered ideal for self-examination, 191 were thought to be incapable of doing this. A goal of this program was to instruct these women in mammary self-examination.

5819 QUANTITATIVE ASSESSMENT OF ENVIRONMENTAL POLLUTION BY CANCEROGENIC SUBSTANCES: ONE STAGE IN THE EPIDEMIOLOGICAL STUDY OF TUMOURS. *(E.)* Smulevich, V. B. (Acad. Med. Sci., Moscow, U.S.S.R.) and M. A. Bulbulian. *Int J Epidemiol* 3(4):321-323, 1974.

Various factors in the working environments of Moscow passenger transport drivers were assessed quantitatively as part of a study of the epidemiology of environmental carcinogenesis. About 300 itineraries and questionnaires from 495 drivers were studied, and air samples from the motor bus cabins and trolley busses were analyzed for benzo(a)pyrene. Benzo(a)pyrene was found in concentrations of 0.68-7.8 μg/100 m^3 air in all of the driving compartments, the concentrations being higher in the motor buses than in the trolley cars. Based on the number of hr/yr worked by the drivers, the trolley bus driver inhales an average of 53.6 μg benzo(a)pyrene/yr and the motor bus driver inhales 94.6 μg. Twice as much benzo(a)pyrene is inhaled in the winter as in the summer. Over a total working life of 39 yr, the trolley bus driver inhales 2 mg of benzo(a)pyrene and the motor bus driver inhales 4 mg. Thus, the total inhaled dosage is considerably lower than the maximum tolerable dosage (13.3) of this compound. Since there are other sources of benzo(a)pyrene exposure in the environment, the quantitative assessment of these environmental factors is necessary in the epidemiological assessment of tumors and pretumor conditions.

5820 PRIMARY LIVER CANCER RATE AND AFLATOXIN INTAKE IN A HIGH CANCER AREA. *(E.)* Van Rensburg, S. J. (Natl. Inst. Nutr. Dis. South African Med. Res. Counc., Tiervlei), J. J. Van der Watt, I. F. H. Purchase, L. Pereira Coutinho and R. Markham. *S Afr Med J* 48(60):2508a-2508d, 1974.

The relationship between primary liver cancer rate and aflatoxin intake was investigated in the high cancer area of the Inhambane district of Mozambique. The age and sex distribution of the disease was obtained by means of a hospital registration program and data on the absolute occurrence of the disease extracted from the health records of gold miners originating from the study area. The two sets of data were used to calculate the specific cancer rates according to age and sex, in addition to the overall cancer rate for the population. Values for the 1964-1968 and 1969-1971 periods were 35.5 and 25.4/100,000/yr, resp. The disease occurred more than twice as often in males as in females. The extent of aflatoxin contamination of prepared food consumed by the population was determined through the chemical assay of 880 meals collected at random. The mycotoxin was found in 9.3% of all samples, resulting in a mean contamination of all prepared food of 7.8 μg/kg wet food, and a mean daily per capita consumption of 222.4 ng/kg (15 μg/adult/day). The pooling of these data with similar studies in lower incidence areas elsewhere revealed a significant correlation between the level of aflatoxin consumption and the liver cancer rate. The result represent both the highest primary liver cancer rate reported and the highest known aflatoxin intake.

5821 EPIDEMIOLOGY OF CANCER OF THE OESOPHAGUS IN INDIA. *(E.)* Gangadharan, P. (Tata Mem. Hosp., Bombay, India). *India J Surg* 36(8):293-298, 1974.

The incidence, mortality, distribution, and high risk factors associated with cancer of the esophagus in India were studied. Sources of data included the Bombay Cancer Registry reports for the greater Bombay area, the medical reports of the various Indian hospitals, and mortality rate figures. In the greater Bombay area, the incidence of esophageal cancer between 1964 and 1966 was 6.1/100,000 population for males and 5.1/100,000 population for females. In comparison with rates from other parts of the world, these rates are quite high. The annual death rate from esophageal cancer in the Bombay area during this period was 4.2/100,000 population, esophageal cancer accounting for almost 10% of the deaths due to cancer. Cancer of the esophagus was especially frequent among Hindus from Maharashtra and Gujarat and among Moslems. The risk of esophageal cancer is significantly elevated among smokers and pan chewers, the risk being particularly high among males indulging in both habits. These data indicate that esophageal cancer is an important problem in India and point to the need for further investigation into the epidemiology and risk factors associated with this disease.

5822 STOMACH CANCER AND ECOLOGICAL FACTORS IN JAPAN. *(E.)* Takahashi, E. (Tohoku Univ. Sch. Med., Sendai, Japan). *Tohoku J Exp Med* 113 (2):129-133, 1974.

The relationship between mortality from stomach cancer and various ecological factors was studied in 46 Japanese prefectures. Age-adjusted mortality rates from stomach cancer were obtained from the national mortality statistics for the period 1960-1970. This data was correlated with data relating to the average yearly temperatures, average yearly durations of sunshine and water quality of the rivers within each prefecture. There was no correlation between mortality from stomach cancer and average yearly temperature, but there were significant negative correlations between stomach cancer among males and the $Ca:SO_4$ ratio of the river water and the yearly duration of sunshine. It is hypothesized that the amount of sunshine and water quality are causally related to the incidence of stomach cancer. Greater amounts of sunshine promote the production of vitamin D by the skin and increase the absorption of calcium by the intestinal tract. Since calcium has an antiphlogistic effect on the gastric mucus membrane and it may also prevent the lodging of tumor cells during the hematogenous metastasis of cancer in the microcirculatory system, increased calcium consumption in the drinking water and increased absorption by the intestinal tract would be expected to correlate with reduced rates of stomach cancer.

5823 PRIMARY HEPATIC CANCER IN INFANCY AND CHILDHOOD: A SURVEY OF TWENTY CASES. *(E.)* Sinniah, D. (Dep. Pediatr., Univ. Malaya, Kuala Lumpur, Malaysia), P. E. Campbell and J. H. Colebatch. *Prog Pediatr Surg* 7:141-170, 1974.

The epidemiological, clinical, pathological, and therapeutic data in 20 cases of primary hepatic cancer seen at the Royal Children's Hospital in Melbourne between 1950 and 1972 were studied to help define the incidence, pathological classification, and prognosis of this disease among children. The clinical records and autopsy protocols of all 20 cases were reviewed together with all histological specimens obtained at biopsy and/or post mortem. These 20 cases of primary hepatic cancer represent 2.0% of all childhood malignancies seen at this institution during the period in question. The 20 cases included 14 cases of hepatoblastoma, and 4 cases of hepatocarcinoma. Most of the patients were of Anglo-Saxon stock and under 5 yr of age at the onset of symptoms; 10 of the children were male. Initial symptoms included abdominal swelling, loss of weight, anorexia, and vomiting. With the exception of the determination of serum alpha-fetoprotein, hematological and biochemical tests were generally of little value in establishing the diagnosis. Roentgenological studies were helpful in the preoperative diagnosis of primary hepatic cancer. Other procedures which proved useful in the diagnosis and management of these cases were inferior vena cavography, hepatic and celiac arteriogram, and liver scan. Accurate diagnosis depended largely on preoperative liver biopsies. The prognosis in hepatocarcinoma was poor, but treatment can affect the prognosis of hepatoblastoma. Excision of the tumor or partial hepatectomy is essential in the treatment of the latter and irradiation and chemotherapy, although less effective, are important forms of adjuvant therapy. These procedures, along with early diagnosis, appear to offer the best hope for survival.

5824 LYMPHORETICULAR DISEASE IN KENYA: PATHOLOGICAL PATTERN OF THE SUPERFICIAL LYMPHA-
DENOPATHIES. *(E.)* Kasili, E. G. (Univ. Nairobi Med.
Sch., Kenya) and T. S. Shah. *Trop Geogr Med* 26(3):
242-256, 1974.

The pattern of lymphoreticular disease in Kenya was
evaluated. Daily registers of surgical biopsy speci-
mens for 1965, 1968, 1969, and 1970 were scrutinized
for all lymph node biopsies done for the investiga-
tion of external lymphadenopathies. A total of 2082
lymph node biopsies were seen over the period of
four years, and 1918 pathological biopsies were ana-
lyzed. The neck turned out the largest number
(65.5%) of biopsies. The abnormal lymph node biop-
ies were classified according to their pathology;
53 were tuberculous, 477 were non-specific reactive
ymphadenitis, 322 were metastatic tumors and 247
ere malignant lymphomas. Of the malignant lympho-
as, 48.5% were males and 20.2% were females over
he age of 14, while 23% were younger males and
.5% were younger females. Hodgkin's disease con-
tituted 45.7% of the malignant lymphomas; lympho-
arcoma constituted 28.0%, reticulum cell sarcoma
8.6% and other malignant lymphomas 7.7%. Of those
ith Hodgkin's disease, 24.8% were classified as
eing lymphocytic predominant, 20.4% were nodular
clerosing, 20.4% were mixed cellular, and 31.8%
ere lymphocytic depleted. A possible immunologic
efect was advanced as the reason for the prepon-
erance of the bad prognostic histological types of
odgkin's disease. Of the tuberculous lesions,
.4% had a poor inflammatory response, 24.5% had
intermediate response, and 11.7% had a high
flammatory response. An immunologic defect was
so postulated as the reason for the high incidence
non-reactive tuberculous adenitis.

25 STUDY OF HL-A GENOTYPES IN A CASE OF FAMILIAL CHRONIC LYMPHOCYTIC LEUKAEMIA (CLL).
.) Delmas-Marsalet, Y. (Reg. Blood Transfus. Cent.,
lle, France), J. Hors, J. Colombani and J. Daus-
t. *Tissue Antigens* 4(5):441-443, 1974.

od groups and histocompatibility antigens (HL-A)
e determined in 12 members of a family with four
lings suffering from chronic lymphocytic leu-
ia (CLL). The parental haplotypes were Da25,
A13/HL-A3, W5 and HL-A2, HL-A12/W32, W5. The
e HL-A haplotype [Da25 (W30 + W31), HL-A13]
shared by three of the diseased siblings. This
e, together with a similar family study showing
t three of five disease siblings shared two an-
ens (HL-A2 and W3), suggests a possible linkage
ween HL-A and susceptibility to CLL. The three
otheses that could account for a dominant susceptibility are outlined: the HL-A antigens (or products of very closely linked genes) are the receptors of the potential agent; these antigens share some structure with this agent which prevents immunization; and there is a dominant manifestation of an immune response gene.

5826 THE OVA IN VERTICAL TRANSMISSION OF LEUKEMIA. *(E.)* Rich, M. A. (Albert Einstein Med. Cent., Philadelphia, Pa.), R. Rich and L. Johns. *Bibl Haematol* (39):362-369, 1973.

This study was initiated in order to determine if the ova of leukemic mice may be involved in the vertical transmission of leukemia in this species. Unfertilized ova obtained from virus inoculated Swiss ICR/Ha mice following gonadotropin induced ovulation were examined with an electron microscope for the presence of virions. No virions were observed in the 14 ova examined 26, 45, and 66 days following the inoculation of Rich strain murine leukemia virus. Virions were observed in other tissues obtained from these animals. An attempt was also made to infect ova *in vitro* by maintaining ova in infected fibroblast cultures and in uninfected fibroblast cultures with subsequent inoculation of leukemia virus. No virions were observed within the ova in either case. It is concluded that in mice the intact ovum cannot be infected by leukemia virus *in vivo* or *in vitro.*

5827 INCIDENCE OF CANCER OF THE UTERINE CERVIX IN KINGSTON, JAMAICA, 1958-1970. *(E.)* Persaud, V. (No affiliation). *West Indian Med J* 23 (1):8-14, 1974.

The incidence of cancer of the uterine cervix among permanent residents of the Jamaican parishes of Kingston and St. Andrew was studied for the period 1958-1970. Data were obtained from the case records entered in the files of the Jamaica Cancer Registry and were compared with returns from the Registrar General. During the 13-yr study period, 1,170 cases of cervical cancer were registered among the general population (an average of 33 cases per 100,000 population per yr). The maximum incidence was among persons in the seventh decade of life. Cervical cancer accounted for 16% of all cancers in the Kingston-St. Andrew population between 1958 and 1966. It was by far the most common malignancy among females, accounting for 27% of all cancers in females. The age-specific incidence pattern for cervical cancer was similar to that for breast cancer in this population. The crude annual mortality rate from cervical cancer was 15.5 per 100,000 population, with about half the patients dying within a year of diagnosis. When compared with other populations, the incidence of cervical cancer in Jamaica was exceeded only by the incidences in Cali, Columbia and Bulawayo, Southern Rhodesia. The age-specific incidence pattern in the Jamaican Negro population was similar to those of the Negro populations of South African Bantu and Cali, but differed from incidence rates among white populations (Denmark and Britain) in which the peak incidence is in middle life. These findings refute earlier observations indicating that cancer of the cervix in Jamaica was most common among younger women.

5828 UNCERTAINTY OF GROWTH OF CELL POPULATIONS IN CANCER. *(E.)* Blum, H. F. (Skin Cancer Hosp., Temple Univ., Philadelphia, Pa.). *J Theor Biol* 46(1):143-166, 1974.

Uncertainty regarding the size of cell populations and rate of cell duplication is taken into account in a probabilistic model which describes quantitatively the induction of tumors in albino mice by UV radiation (including wavelengths 320 nm and shorter). The tumors were epidermal carcinomas, dermal sarcomas, or mixtures of both. A systematic change in the composition of tumor populations was demonstrated with change in time relationships of dosage but not with other conditions. Quantitative relationships indicate that overall cell population growth is governed by feedback control of metabolite supply. It is noted that cancer induction was intensity-dependent and that cancer appeared later when dosage was stopped before the end-point was reached. Limits on the feedback control mechanism are discussed. Attempts to extend the probabilistic model to cancer inductions with other agents (Rous sarcoma virus, carcinogenic hydrocarbons) are described. Results show that the kinetics of cancer induction and growth differ with agent and with the manner in which it is introduced into the tissues. The implications of the model for cancer therapy and for establishment of tolerance levels for cancer-inducing agents are briefly considered.

5829 GRANULOPOIESIS AND CELL KINETICS IN CHRONIC MYELOID LEUKAEMIA. *(E.)* Gavosto, F. (Gen. Med. Clin., Univ. Turin, Italy). *Cell Tissue Kinet* 7(2):151-163, 1974.

Labeling indexes (LIs) for myeloblasts were evaluated in 12 cases of chronic myeloid leukemia (CML) in the chronic stage and 16 cases in blast crisis. Results were compared with LIs previously reported for myeloblasts, promyelocytes, and myelocytes in CML and normal bone marrow. Myeloblast generation time and other parameters of granulopoiesis kinetics were determined for one patient in blast crisis (86% myeloblasts) and for cases reported in the literature. Notable differences in mean myeloblast LIs were demonstrated between chronic CML and blast crisis and between CML and normal marrow. Myeloblast LIs were relatively high in chronic CML but fell as low as 5% during blast crisis. Comparison of granular and nongranular myeloblasts showed significantly lower LIs for the nongranular form in chronic CML. LIs for promyelocytes and myelocytes did not differ significantly in CML and normal marrow. Kinetic analysis indicated that myeloblast generation and DNA synthesis times in CML are shorter than those of more differentiated cells, and that myeloblast cycle time and duration of the S phase are apparently longer in blast crisis than in the chronic stage. The kinetic data also suggest an excess of production over efflux from the proliferating compartment in CML, indicating ineffective granulopoiesis. In CML the transit time in the proliferating compartment was estimated as more than 200 hr. The unlimited cell population growth observed in CML is concluded to be dependent on the progressive enrichment of the leukemic stem pool. In the progression to blast crisis, differentiating clones may be gradually replaced by others derived from stem cells that have lost genetic control over their differentiation. These new clones might then develop at a rate of growth that exceeds that of their predecessors, leading to the gradual preponderance of blasts within the leukemic population as a whole. In this respect, the chronic stage of CML and acute blast crisis may be seen as different leukemic processes.

5830 CELL CONTACT AND CELL DIVISION. *(E.)* Castor, L. N. (Fox Chase Cent. Cancer Med. Sci., Philadelphia, Pa.). In: *Developmental Aspect of Carcinogenesis and Immunity* edited by T. J. King. New York, Academic Press, Inc., 1974, pp. 43-64.

Contact interactions between cells *in vitro* were studied, particularly with respect to how they lead to control of division in cells cultured from normal tissues and how the control mechanism breaks down in tumor cells. Mouse 3T3 cells, WI-38 fibroblasts, epithelial-like rat liver and mouse spleen cells, and neoplastic cells derived from these cells were established in tissue culture and the population kinetics determined by frame-by-frame inspections of cinemicrographic measurements. As the cultures derived from normal, non-neoplastic tissues became crowded, the rate of cell division became increasingly inhibited. The inhibition began concomitantly with a change toward a more compact cell shape imposed by contacts between cells. The inhibition was not caused by depletion or modification of the culture medium by the cells, since it occurred when the medium was being continuously perfused. In perfusion culture, three types of inhibition were distinguishable by different cell behavior patterns with increasing population density, by contact inhibition in 3T3 and some epithelial-like cells, by contact regulation in other epithelial-like cells and by a partial inhibition in WI-38 fibroblasts. The rate of division in postconfluent cultures depended on the concentration of serum protein in the culture medium. It is proposed that stretching of the cell surface is required for the effect of serum macromolecules to be transmitted into the cells, and that the stretching is increasingly prevented as the population density increases. Neoplastic cells require a lower serum concentration than normal cells for a given rate of division at a given population density and at fixed serum concentration they divided more rapidly and reached higher population densities.

5831 SALIVARY GLAND TUMOURS IN PONDICHERRY. *(E.)* Budhraja, S. N. (Jawaharlal Inst. Postgrad. Med. Educ. Res., Pondicherry, India), N. K. Pasupathy and W. J. Perianayagam. *Indian J Surg* 36(6):235-239, 1974.

332 STUDIES ON CANCER MORTALITY IN HAWAIIAN
FILIPINOS, 1961-70. *(E.)* Alcantara, A.
(Med. Off., Lapu Lapu, Philippines) and B. M.
ennett. *Hawaii Med J* 33(8):292-294, 1974.

333 FREQUENCY OF MALIGNANT TUMOURS IN DIABETES
MELLITUS. *(E.)* Rostlapil, J. (Lekarska
c. Hyg., Karlovy Univ., Prague, Czechoslovakia)
d M. Zrustova. *Acta Diabetol Lat* 11(1):43-45,
74.

34 QUANTITATIVE OBSERVATION OF LEUKEMIC CELLS
AND NORMAL HEMATOPOIETIC CELLS IN THE BONE
RROW DURING THE TREATMENT OF ACUTE LEUKEMIA. *(E.)*
shima, T. (Nihon Univ. Sch. Med., Tokyo, Japan).
ta Haematol Jpn 37(2):73-92, 1974.

35 THYROID CARCINOMA IN SENDAI, JAPAN. *(E.)*
Fukunaga, F. H. (Kuakini Hosp., Honolulu,
aii), R. Yatani and N. Sasano. *Tohoku J Exp Med*
(2):181-185, 1974.

6 BCG VACCINATION AND LEUKEMIA MORTALITY.
(E.) Rosenthal, S. R. (Univ. Illinois
. Cent., Chicago), R. G. Crispen, M. G. Thorne,
Piekarski, N. Raisys and P. Rettig. *Recent Re-*
ts Cancer Res 47:421-425, 1974.

7 CYTOKINETIC STABILITY OF AN EHRLICH ASCITES
TUMOR. *(E.)* Schiffer, L. M. (Allegheny
. Hosp., Pittsburgh, Pa.) and A. M. Markoe. *Cell*
sue Kinet 7(3):305-308, 1974.

3 CONCURRENT PULMONARY TUBERCULOSIS AND
BRONCHOGENIC CARCINOMA. EXPERIENCE IN
E MUNICIPAL HOSPITAL. *(E.)* Gourin, A. (State
. New York Downstate Med. Cent., Brooklyn) and
yons. *NY State J Med* 74(13):2367-2371, 1974.

ETIOLOGY OF BREAST CANCER. III. OPPORTUN-
ITIES FOR PREVENTION. *(E.)* Morgan, R. W.
. Preventive Med., Univ. Toronto, Canada) and D.
akil. *Can Med Assoc J* 111(9):1105-1107, 1974.

MALIGNANT LYMPHOMA OF THE TESTIS IN IN-
DIANS. *(E.)* Sampat, M. B. (Tata Mem.
., Bombay, India), M. V. Sirsat and M. R. Kamat.
Urol 46(5):569-575, 1974.

BIOCHEMICAL STUDIES OF MALIGNANT TRANSFOR-
MATION AT THE CELLULAR LEVEL. I. EPIDEM-
GICAL STUDIES OF CANCER IN SOUTHERN AFRICA. *(E.)*
ngton, J. S. (Natl. Cancer Assoc. South Africa,
nesburg). *S Afr Cancer Bull* 17(4):162-166,

INCREASE OF PREMALIGNANT CERVICAL LESIONS
IN TEENAGERS. *(E.)* Punnonen, R. (Dep.
t. Gynaecol., Univ. Turku, Finland), M. Gron-
and R. Peltonen. *Lancet* 2(7886):949, 1974.

5843 AUTORADIOGRAPHIC STUDIES ON CELL NUCLEIC DNA SYNTHESIS IN VARIOUS ENDOMETRIAL CHANGES IN EXPERIMENTALLY INDUCED ADENOCARCINOMA OF RABBITS. *(E.)* Tohyama, A. (Jikei Univ. Sch. Med., Tokyo, Japan). *Jikeikai Med J* 21(3/4):259-278, 1974.

5844 STOCHASTIC PROCESSES FOR SOLID TUMOR KINETICS. I. SURFACE-REGULATED GROWTH. *(E.)* Wette, R. (Sch. Med., Washington Univ., St. Louis, Mo.), I. N. Katz and E. Y. Rodin. *Math Biosci* 19(3/4):231-255, 1974.

5845 OCCUPATIONAL CANCER. *(E.)* Murray, R. (No affiliation). *UICC Bull* 12(4):1-3, 1974.

5846 EPIDEMIOLOGY OF CANCER IN THE INDIAN SUB CONTINENT. *(E.)* Jussawalla, D. J. (Tata Memorial Cent., Bombay, India) and P. Gangadharan. *Indian J Cancer* 11(2)Suppl:3-10, 1974.

5847 CANCER AMONG WORKERS IN THE ASBESTOS TEXTILE INDUSTRY. *(E.)* Newhouse, M. L. (London Sch. Hyg. Trop. Med., England). In: *Biol Eff Asbestos, Proc Work Conf, 1972* edited by P. Bogovski, V. Timbrell, J. C. Gilson, J. C. Wagner. Lyon, France, International Agency for Research on Cancer, 1973, pp. 203-208.

5848 CANCER IN CHRYSOTILE MINES AND MILLS. *(E.)* McDonald, J. C. (Dep. Epidemiol. Health, McGill Univ., Montreal, Canada). In: *Biol Eff Asbestos, Proc Work Conf, 1972* edited by P. Bogovski, V. Timbrell, J. C. Gilson, J. C. Wagner. Lyon, France, International Agency for Research on Cancer, 1973, pp. 189-194.

5849 MALIGNANCY IN RELATION TO CROCIDOLITE AND AMOSITE. *(E.)* Webster, I. (Natl. Res. Inst. Occup. Dis. S. Afr. Med. Res. Counc., Johannesburg, South Africa). In: *Biol Eff Asbestos, Proc Work Conf, 1972* edited by P. Bogovski, V. Timbrell, J. C. Gilson, J. C. Wagner. Lyon, France, International Agency for Research on Cancer, 1973, pp. 195-198.

5850 MORTALITY AND MORBIDITY OF EMPLOYEES OF ANTHOPHYLLITE ASBESTOS MINES IN FINLAND. *(E.)* Meurman, L. O. (Univ. Cen. Hosp. Kuopio, Finland), R. Kiviluoto and M. Hakama. In: *Biol Eff Asbestos, Proc Work Conf, 1972* edited by P. Bogovski, V. Timbrell, J. C. Gilson, J. C. Wagner. Lyon, France, International Agency for Research on Cancer, 1973, pp. 199-202.

5851 THE VALUE OF A CANCER REGISTER IN THE STUDY OF ASBESTOS TUMOURS. *(E.)* Greenberg, M. (Employment Med. Advis. Serv., London, England). In: *Biol Eff Asbestos, Proc Work Conf, 1972* edited by P. Bogovski, V. Timbrell, J. C. Gilson, J. C. Wagner. Lyon, France, International Agency for Research on Cancer, 1973, pp. 273-276.

5852 CANCER RISK OF INSULATION WORKERS IN THE UNITED STATES. *(E.)* Selikoff, I. J. (Mount Sinai School of Medicine, New York, N.Y.), E. C. Hammond and H. Seidman. In: *Biol Eff Asbestos, Proc Work Conf, 1972* edited by P. Bogovski, V. Timbrell, J. C. Gilson, J. C. Wagner. Lyon, France, International Agency for Research on Cancer, 1973, pp. 209-216.

5853 THE NATURAL HISTORY OF DIFFUSE MESOTHELIOMA. *(E.)* Elmes, P. C. (Queen's Univ. Belfast, Inst. Clin. Sci., United Kingdom). In: *Biol Eff Asbestos, Proc Work Conf, 1972* edited by P. Bogovski, V. Timbrell, J. C. Gilson, J. C. Wagner. Lyon, France, International Agency for Research on Cancer, 1973, pp. 267-272.

5854 AN INTERNATIONAL STUDY OF BREAST CANCER. *(E.)* Lowe, C. R. (Dep. Soc. Occup. Med., University of Wales, Cardiff, Wales). *Proc R Soc Med* 67(7):682-683, 1974.

5855 PROPORTIONAL MORTALITY AMONG VINYL-CHLORIDE WORKERS. *(E.)* Purchase, I. F. H. (Cent. Toxicol. Lab., Imp. Chem. Ind. Ltd., Macclesfield, England) and K. S. Williamson. *Lancet* (7880):591-592, 1974.

5856 EPIDEMIOLOGY OF CANCER OF THE CERVIX UTERI. *(Ger.)* Sachs, H. (Gynecol. Clin., Hamburg Univ., West Germany) and C. Hasche. *Geburtshilfe Frauenheilkd* 34(11):921-930, 1974.

5857 THE EPIDEMIOLOGY OF OVARIAN CANCER IN THE BIALYSTOK PROVINCE DURING 1966-1971. *(Pol.)* Kazanowska, W. (Inst. Obstet. Gynec., Med. Acad., Bialystok, Poland), D. Filipowska and J. Goszczynski. *Folia Med Bialostoc* 3:75-80, 1974.

5858 PRECANCEROUS FORMS AND CERVICAL CANCER IN THE 1ST CLINIC OF OBSTETRICS AND GYNECOLOGY, MEDICAL SCHOOL, GDANSK. AN ANALYSIS. *(Pol.)* Szczepanski, J. (Dept. Obstet. Gynec., Acad. Med., Gdansk, Poland). *Folia Med Biolostoc* 3:39-43, 1974.

5859 THE EPIDEMIOLOGY OF BREAST CANCER IN THE BIALYSTOK PROVINCE. *(Pol.)* Ostrowski, L. (Oncol. Cent., Bialystok, Poland), M. Grygoruk, M. Chmay and W. Starosciak. *Folia Med Bialostoc* 3:87-93, 1974.

5860 LUNG CARCINOMA MORBIDITY IN THE PERIOD 1962-1971 IN THE BIALYSTOK PROVINCE. *(Pol.)* Kiluk, S. (Oncol. Cent., Bialystok, Poland), L. Kiluk, L. Ostrowski and E. Piktel. *Folia Med Bialostoc* 3:95-100, 1974.

5861 THE INCIDENCE OF LEUKAEMIAS AND MALIGNANT GRANULOMA IN THE MATERIAL OF THE DEPARTMENT OF MORBID ANATOMY OF MEDICAL SCHOOL IN BIALYSTOK DURING 1953-1967. *(Pol.)* Nowak, H. F. (Inst. Path. Anat., Med. Acad., Bialystok, Poland), J. Popow, L. Glowinska and S. Tyszkiewicz. *Folia Med Bialostoc* 3:101-105, 1974.

5862 THE MORBIDITY FROM LYMPHATIC SYSTEM NEOPLASIA IN THE BIALYSTOK PROVINCE. *(Pol.)* Korfel, A. (Oncol. Cent., Bialystok, Poland), I. Lewicka and C. Gajewski. *Folia Med Bialostoc* 3:107-112, 1974.

5863 THE INCIDENCE OF NEOPLASMS IN THE DISSECTION MATERIAL OF THE COUNTY HOSPITAL IN LOMZA. *(Pol.)* Schramm, S. (Pathoanat. Lab., District Hosp., Lomza, Poland). *Folia Med Bialostoc* 3:133-137, 1974.

See also:

* (Rev): 5419, 5420, 5438
* (Chem): 5505, 5508, 5509
* (Path): 5754

5864 GASTROSCOPIC BIOPSIES IN GASTRIC DISEASE: A COMPARATIVE STUDY WITH X-RAY, GASTROSCOPY AND CLINICAL EVALUATION. *(E.)*

Myren, J. (Ulleval Univ. Hosp., Oslo, Norway) and A. Serck-Hanssen. *Acta Pathol Microbiol Scand* [*A*] (Suppl 248):137-144, 1974.

he use of gastroscopy with directed biopsies in the iagnosis of gastric malignancy is described and ompared to routine X-ray examination and clinical valuation. Records of 200 patients treated in ospitals and clinics in Norway during the years 968-1970 were examined. Gastroscopy was performed fter x-ray examinations were made. About four iopsies were obtained from all tumors, ulcers, and uspected lesions. An additional 501 biopsies were aken from the body of the stomach. Malignancy as a definite or possible diagnosis following x-ay examination in about half of the cases diagnosed istologically on resected specimens. Gastroscopy lone concluded with a definite or possible diagnosis malignancy in about 80% of the cases. The gastro-opist's suspicion of malignancy could not be veri-ed histologically in 20%. Gastroscopy demonstrat-gastric ulcers in ten cases in which the x-ray amination was normal. In 15%, however, the gas-oscopic biopsies provided a definite histological agnosis of malignancy in 23/27 cases. Two of the ilures were due to loss of the material during ocessing while in the other two cases there was malignancy. A positive result of malignancy was tained in 1/2 to 1/9 of the biopsies from each tient. Biopsies from the antrum and body showed at the percentage of normal mucosa was higher in e latter. The percentage of biopsies with intes-nal metaplasia was more than four times higher in e antrum than in the body; the greatest difference s for patients with gastric ulcers. When the sults from the greater and lesser curvatures were pared, the differences were less pronounced. The rcentage of cases with a histological diagnosis intestinal metaplasia was 20 for the lesser curva-e compared to eight for the greater. The most ortant conclusion is that gastroscopy with direct-biopsy sampling of material for microscopic mination is of particular importance in patients viously examined only by routine x-ray procedures.

ATTEMPTS OF TRANSMISSION OF THE NEWT MELAOMA BY NUCLEIC ACID PREPARATIONS. *(It.)*

nella, T. (Istituto Zool., Universita Milano, y) and E. Camerini. *Tumori* 60(2):123-141, 1974.

mpts were made to obtain DNA extracts with tumor-ic activity from the melanoma of the newt (*Tri-s cristatus* Laur.). The DNA, prepared by two erent methods from melanomas that had been trans-ed by cells for several generations, was injected into adult animals. Control animals were not ted or received DNA isolated from normal homolo-organs. In all 320 animals were used, 238 being n DNA. The DNA preparations obtained according ne procedure of Colter *et al.* failed to induce rs in any of the 111 inoculated animals, while reatment with DNA extracted according to Kirby's method (127 cases) from tumors as well as from normal tissues resulted in the development of melanomas with an incidence significantly higher than that observed in the untreated control group; the activity of the extracts was not modified by DNAse treatment. The influence of factors such as tumor spread in the donors, duration of observation, geographical origin of animals, and season of treatment was considered. Altogether 934 animals were studied, including those of other experimental series reported elsewhere: 670 were given nucleic acids extracted from tumors or normal organs, 204 received tumor or normal organ transplants, and 60 were untreated. The overall incidence of melanoma was much higher in animals coming from highly industrialized areas, i.e., in the newts from Pavia (54.1%) *vs* those from Naples (11%): the difference between the two groups was highly significant and independent of the treatment. Due to the high tumor incidence in the newts from Pavia, no correlation could be demonstrated between the biological activity of nucleic acid extracts and the above mentioned factors in the 670 animals treated. However, in the case of the newts from the Naples area, a significantly higher frequency of tumors was observed after treatment with nucleic acids extracted from melanoma than after treatment with nucleic acids from normal organs.

5866 THE CELLULAR BIOLOGY OF A NEWLY ESTABLISHED CELL LINE OF HUMAN OVARIAN ADENOSARCOMA *IN VITRO*. *(E.)*

Yamada, T. (Sch. Med., Keio Univ., Tokyo, Japan). *Keio J Med* 23(2):53-70, 1974.

A new cell line derived from a moderately well-differentiated papillary serous cystadenocarcinoma resected from a 56-yr-old female has been characterized. The cultures, grown as monolayers, showed piling up of cells with prominent vesicle formation. Individual cells were epithelioid and resembled closely those from the original tumor in both morphology and chromatin pattern. The culture doubling time of the 26th generation was 28 hr. Most cells were diploid or near diploid and almost all chromosomes had a large telocentric marker chromosome. Inoculation of 10^6 or more cultured cells into the cheek pouches of untreated or cortisone-injected hamsters resulted in tumor growth (100%) with histology characteristic of papillary adenocarcinoma. The use of this established cell line may prove useful in research on the characteristics and therapy of human ovarian papillary serous adenocarcinoma.

5867 BIOLOGICAL INDIVIDUALITY OF HUMAN BREAST CARCINOMAS STUDIED IN ORGAN CULTURE. *(E.)*

Tannenberger, St. (Cent. Inst. Cancer Res., Berlin, East Germany), E. Nissen and A. Mohr. *Proc Fifth Int Symp Biol Characterization Hum Tumors, Bologna, April 4-6, 1973,* 1:233-238, 1974.

The biological variation of 21 human breast cancer tissue samples studied *in vitro*, by measuring the alteration of DNA synthesis by cytostatic drugs is described. Mitotic activity, as measured by ^{3}H-thymidine labelling, varied 100 fold; in four samples, DNA synthesis was inhibited in 3/4 by methyl-GAG, 1/4 by vinblastine and 1/4 by 5-fluorouracil. DNA synthesis in one tumor was unaffected by all three drugs. DNA synthesis of cancer tissue cultured 48 hr in autologous serum-supplemented media, was higher in eight cases and lower in five cases than DNA synthesis in calf serum-supplemented media. The eight elevated values were from advanced cancer patients. Incubation of one cancer tissue in normal or heat-activated autologous and AB type serum revealed a tumor-specific heat-sensitive factor in the cancer patients' serum. DNA synthesis of autologous lymphocytes was stimulated by mixed organ culture with cancer tissue separated by a diffusible membrane, in 7/14 cases. Maximal stimulation was associated with early stage tumors. The pronounced heterogeneity in breast cancers of the type described here suggests that their response to different forms of therapy may also be varied unless appropriate choices can be made on the basis of such *in vitro* evaluation.

5868 HUMAN NEUROBLASTOMA CELLS MAINTAINED IN CONTINUOUS CULTURE: MORPHOLOGICAL, TUMORIGENIC, CYTOGENETIC, AND BIOCHEMICAL CHARACTERISTICS.

(E.) Biedler, J. L. (Mem. Sloan-Kettering Cancer Cent., N.Y.) and L. Helson. *Maandschr Kindergeneeskd* 42(9/10):423-427, 1974.

Two cell lines obtained from the metastatic tissue of patients with neuroblastoma were described. The SK-N-SH line established from the bone marrow of a four-year-old girl with disseminated neuroblastoma consisted of small, neuroblastic-like cells and large, flattened epithelioid cells. Line SK-N-MC obtained from the trypsinized explant of a metastatic orbital tumor mass in a 15-year-old girl was comprised of small, somewhat fibroblast-like cells with scant cytoplasm. The population doubling times were 32 hr for SK-N-MC and 44 hr for SK-N-SH and the cells showed no density-dependent growth inhibition. Both lines induced tumors in moderate frequency when injected into the cheek pouches of weanling Syrian hamsters; the masses produced had the appearance of malignant tumors with numerous mitotic figures. The modal chromosome numbers of both lines were in the diploid range, both lines had a unique and stable set of structurally abnormal, or marker, chromosomes, and the cells of the SK-N-MC line contained a variable number of double-minute chromosomes. The frequency of these double minutes decreased with time in tissue culture. The SK-N-MC cells have shown no morphological differentiation in response to dibutyryl cyclic AMP. The SK-N-SH line and its neuroblast-like clonal subline SH-SY show high dopamine-hydroxylase activity, whereas an epithelial clonal subline, the SK-N-MC line, and its twice-cloned subline MC-IXC show no detectable activity. However, the SK-N-MC cells do possess choline acetyl-transferase activity. The results suggest that both SK-N-SH and SK-N-MC are of neuronal origin and that they have the *in vivo* and *in vitro* characteristics of malignant cells.

5869 CELLULAR TUMORIGENICITY IN NUDE MICE: CORRELATION WITH CELL GROWTH IN SEMI-SOLID MEDIUM.

(E.) Freedman, V. H. (Albert Einstein Coll. Med., New York, N.Y.) and S. Shin. *Cell* 3(4):355-359, 1974.

When tumorigenicity of a group of heteroploid cell lines derived from both normal and malignant tissue of five mammalian species was tested in nude mice, all except mouse 3T3 produced tumors. None of the primary diploid fibroblasts from embryonic and adult tissues were tumorigenic. Representative cells screened for tumorigenicity in nude mice were able to form colonies in methyl cellulose in semi-solid medium, while the non-tumorigenic cells showed no growth in this medium. In experiments with a large number of cell lines, no exception to this correlation of tumorigenicity in nude mice and proliferation in semi-solid medium was encountered. Tumors produced in nude mice by injection of cultured cells always grew as single well defined encapsulated masses; no metastases or invasion were observed. Even when Ehrlich ascites tumor cells were injected i.p. in nude mice, only solid tumors appeared. Tumors preserved the genetic markers of the original cell lines, and tumors from BHK-21 tested for species-specific isoenzymes showed only those of BHK-21, indicating absence of host cell recruitment. The process by which a diploid culture becomes a heteroploid cell line does not confer tumorigenicity since mouse 3T3 did not produce tumors. These results show that nude mice are appropriate for studies of cellular tumorigenicity and suggest that tumorigenicity *in vivo* of cultured cells may be determined by the same mechanism which enables the cell to overcome the requirement for anchorage *in vitro*.

5870 NORMAL AND MALIGNANT FIBROBLAST-LIKE CELL CULTIVATION ON DIFFERENT POLYMER SUBSTRATES.

(Rus.) Slavnaya, I. L. (U.S.S.R. Acad. Med. Sci., Moscow), Y. A. Rovensky, E. V. Smurova and S. P. Novikova. *Tsitologiia* 16(10):1296-1300, 1974.

Peculiarities of attachment and growth of normal or tumorous cells on substrates of different materials and textures were studied by investigating the growth morphology of mouse embryonic fibroblast-like cells and neoplastic fibroblasts of the L-strain. As substrates, glass slides as well as chemically unmodified and modified polymer slides, films or fabric (of polyethylene, polyester, teflon, polymethylmethacrylate, PVC, etc.) were used. With glass slides as substrates, the embryonic fibroblast-like cells formed dense monolayers; fibroblasts of L-strain also formed monolayers, but were less spread-out than normal cells. Essentially, similar behavior was observed on polymer slides or films. More complicated behavior and patterns were observed, however, when synthetic fiber fabric was used. Here neither normal nor malignant fibroblasts formed monolayers, but grew separately, extended and oriented to the direction of substrate fibers. Chemical modification of substrate fibers either had no effect on the growth behavior of cells, or showed an inhibiting effect, sometimes leading to the complete suppression of growth and to the death of the cells.

5871 CELL PROLIFERATION AND HISTOLOGY IN EPITHELIAL TUMORS OF THE URINARY BLADDER.

(E.) Hainau, B. (Dep. Pathol., Finsen Inst., Copenhagen, Denmark) and P. Dombernowsky. *Proc Fifth Int Symp Characterization Hum Tumors, Bologna, April 4-6, 1973* 1:34-39, 1974.

The degree of dedifferentiation (anaplasia) in 64
biopsies from 58 patients with bladder tumors was
correlated with a specially calculated potential
doubling time that excludes tumor cell loss, rather
than tumor volume doubling time. Potential doubling
times of bladder cancer patients were compared with
biopsies of bladder epithelium from 19 patients
undergoing diagnosis for non-malignant conditions.
Potential doubling time was derived from labeling
indices of the biopsies multiplied by constants for
the growth rate characteristic of bladder epithelium
and duration of S-phase. The biopsies were incu-
bated at 37 C for 4 hr in 10 ml medium containing
0 μCi ^{3}H-methyl-thymidine (specific activity of 26
Ci/mM). The percentage of labeled cells (labeling
ndex, LI) was determined by consecutively counting
000 tumor cells or transitional epithelium cells.
istological malignancy ratings considered only the
ellular pattern of the epithelium. Potential
oubling time was calculated at 520 days for normal
ladder epithelium. Intraepithelial, solid and
apillary bladder cancers were divided into five
rades (O-IV) with potential doubling time values
anging from 50 days for grade I intraepithelial
umor to 2.1 days for grade IV solid tumors. While
hese values showed a good correlation with the
egree of anaplasia, they were much smaller (by a
actor of ten) than values for tumor volume doubling
me observed by periodic cystoscopy. The finding
f higher labeling indices in papillary tumors,
mpared to solid tumors of the same grade, is
obably due to a greater cell loss from the papil-
ry tumors (indicated by the high shedding rate of
pillary epithelium and the frequent finding of
pillary fragments in the urine).

72 PROPERTIES OF THE CHROMOSOMAL ENZYME, POLY (ADP-RIBOSE) POLYMERASE IN CELL GROWTH AND PLICATION IN NORMAL AND CANCER CELLS.

(E.) Shall,
(Biochem. Lab., Univ. Sussex, Brighton, England),
K. O'Farrell, P. R. Stone and W. J. D. Whish.
*oc Fourth Int Symp Princess Takamatsu Cancer Res
nd, Tokyo* 69-85, 1973.

e properties of a novel chromosomal enzyme system
re investigated under a variety of physiological
nditions in normal mouse fibroblasts (LS), pig lym-
ocytes, and rapidly growing mouse lymphoblastic
ukemia cells (L5178Y). The specific activities
both NAD pyrophosphorylase, which is involved in
e synthesis of NAD, and poly(ADP-ribose) polymer-
e, which used NAD as a substrate to synthesize a
romosomal polymer, showed a temporal correlation
h DNA synthesis. The specific activity of the
ymerase fluctuated markedly in the lymphoid cells
ing the transition from the resting to the grow-
state. It also varied during the growth cycle
tissue culture cells. Most cells had enzymes
ch could synthesize and degrade poly(ADP-ribose).
The physiological function of this chromosomal enzyme is at present unknown, although it is hypothesized that the enzymes involved in nuclear NAD metabolism directly integrate NAD and cellular energy metabolism with DNA synthesis during progression through a single cell generation and in modulation of the growth rate. In particular, it is suggested that poly(ADP-ribose) may function by regulating the initiation of succeeding sets of replicons.

5873 MOLECULAR EVENTS IN DIFFERENTIATION AND DE-DIFFERENTIATION.

(E.) Bonner, J. (Div. Biol., California Inst. Technol., Pasadena). *Biochem Dis* 4(Part B):531-541, 1974.

The derepression of repressed eukaryote genes was investigated in rat liver which was regenerating following partial hepatectomy. The template activity of the chromatin in support of RNA synthesis by RNA polymerase increased after partial hepatectomy. This was paralleled by a decrease in the histone: DNA ratio of the chromatin. During this period there was no DNA synthesis therefore histones must be destroyed. All five major species were destroyed equally. Among the chromosomal nonhistone proteins is a neutral protease which attacked histones in normal, stable cells. It did not attack histones of the chromatin of which it is a component in regenerating liver. When chromatin of three hr regenerating liver was isolated and incubated for a few minutes, and its acid soluble proteins were prepared and chromatographed, large peptides which are degradation products of the histones were recovered. A model was developed which suggests that the genome contains particular sensor genes, genes sensitive to the presence of one or another kind of small molecule. The binding of the effector molecule to its binding protein results in the subsequent binding of the complex to sensor genes that are then derepressed. The binding produces RNA molecules that are either processed into chromosomal RNA or perhaps in some cases translated into particular species of nonhistone chromosomal protein, which then bind in sequence specifically to particular DNA sequences of the genome, perhaps to classes of sequences as classes of middle repetitive RNA. It is the action of these activator molecules that causes histone degradation on adjacent DNA sequence, and thus derepression.

5874 REVERSIBLE SUPPRESSION OF DIFFERENTIATION AND MALIGNANCY IN BROMODEOXYURININE-TREATED MELANOMA CELLS.

(E.) Silagi, S. (Cornell Univ. Med. Coll., New York, N.Y.) and J. R. Wrathall. *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* 361-385, 1973.

Reversible suppression of differentiation and malignancy in melanotic melanoma cells (clone B_559), derived from the B16 mouse melanoma, and treated with 1-3 μg/ml of 5-bromodeoxyuridine (BrdU) is described. The major effects included: alteration in cell morphology and growth pattern, suppression of melanogenesis, suppression of tumorigenic potential and greatly increased production of C-type virus. These effects appeared to be mediated by incorporation of BrdU into DNA as an analog of thymidine, but were reversible upon growth of BrdU treated cells in medium without the drug. During a seven day period of growth with BrdU, the highly melanotic cells, which usually grow as piled foci of spindle shaped or dendritic cells, became amelanotic and flat and exhibited contact inhibition. Melanogenesis was suppressed through a coordinated reduction of tyrosinase activity and premelanosome formation. A dialyzable, heat stable inhibitor of tyrosinase activity appeared in BrdU-treated cells, but was quantitatively insufficient to account for the observed reduction of tyrosinase activity. A single cell cycle (30 hr) with BrdU (3 μg/ml) was sufficient to completely suppress tyrosinase activity for seven days, and the kinetics of reduction were similar to those from cultures grown with BrdU for this entire period. The reduction of tumorigenicity by BrdU is time- and dose-dependent. Injections of non-tumorigenic BrdU-treated melanoma cells protect mice against tumor formation by untreated melanoma cells. Production of C-type virus is greatly increased and virus-associated Gross cell surface antigen becomes detectable on BrdU-treated cells. The number of virus particles produced by these cells appears to be positively correlated with their ability to protect mice against untreated melanoma cells. The use of BrdU offers a probe to dissect cellular control of both differentiated function and malignant potential.

5875 FURTHER STUDIES ON THE INVOLVEMENT OF HISTONE PHOSPHORYLATION IN CELL REPLICATION.

(E.) Chalkley, R. (Sch. Med., Univ. Iowa, Iowa City), R. Balhorn, D. Granner, N. Tanphaichitr and V. Jackson. *Cold Spring Harbor Conf Cell Proliferation* 1:719-728, 1974.

The role of active DNA synthesis and chromosome replication in histone phosphorylation was investigated by studying histone phosphorylation in the presence of inhibitors of DNA synthesis, and repetitive phosphorylation during the cell cycle. In the presence of hydroxyurea, which rapidly inhibited cellular DNA synthesis, histone was synthesized and deposited on the chromosomes in such a way that it was not associated with the post-replicative chromosomal material. Pulse experiments showed that the rate of cellular phosphorylation fell moderately rapidly in the presence of cycloheximide, maximal inhibition (to 40% of the control values) being reached at about 80 min. In the presence of hydroxyurea, maximal inhibition (40-50% of the control values) was attained 5-8 hr after addition of the inhibitor. The rate of phosphate hydrolysis was reduced in the presence of hydroxyurea so that the effect of the reduced rate of phosphorylation was nullified and the overall level of phosphorylation remained unchanged during extended incubation. The hydrolysis of the phosphate groups proceeded slowly for about 50 min in the presence of cycloheximide, after which the rate increased dramatically and the level of the phosphorylated forms of F_1 histone fell sharply. Pulse-chase experiments further indicated that histone was repetitively phosphorylated in the presence of hydroxyurea, and that the newly synthesized histone was distributed among phosphorylated and nonphosphorylated forms in an apparently normal fashion. The results indicate that the inhibition of DNA synthesis alone has relatively little effect on the phosphorylation of the lysine-rich histone.

5876 CELL CYCLE-SPECIFIC CHANGES IN HISTONE PHOSPHORYLATION ASSOCIATED WITH CELL PROLIFERATION AND CHROMOSOME CONDENSATION. *(E.)*

Gurley, L. R. (Cell. Mol. Radiobiol. Group, Los Alamos Sci. Lab., Univ. Calif., N.M.), R. A. Walters and R. A. Tobey. *J Cell Biol* 60(2):356-364, 1974.

In order to correlate histone phosphorylation patterns with specific cell cycle processes and to determine the precise timing of different histone phosphorylation events, the metabolism of histones was studied in synchronized cultures of line CHO Chinese hamster cells. Histone fractions were prepared from (^{3}H)-lysine labeled cells using solvents and solutions containing 0.14 M 2-mercaptoethanol for extraction and recovery of arginine-rich histones. Determination by preparative polyacrylamide gel electrophoresis showed that lysine-rich histone f1 phosphorylation, absent in G_1-arrested and early G_1-traversing cells, commenced two hr before entry of traversing cells into the S phase. To determine whether argininge-rich histone f3 and an f1 subfraction phosphorylation events were related to conversion of dispersed interphase chromatin into condensed mitotic chromosomes, exponential cultures were treated with Colcemid (0.12 g/ml). Phosphorylation of f3 and the f1 subfraction occurred only during the time when cells were crossing the G_2/M boundary and traversing prophase. Results indicate that phosphorylation of histone f1 is one of the earliest occurring biochemical events during the conversion of nonproliferating cells into cell cycle-traversing cells, commencing in G_1 significantly before initiation of DNA replication. Phosphorylation of f3 and the f1 subfraction occurs only during the time of chromosome condensation at the beginning of mitosis. These conclusions are supported by the loss of prelabeled $^{32}PO_4$ from those specific histone fractions during transition of metaphase cells into interphase G_1 cells.

5877 HISTONE METHYLATION AND PHOSPHORYLATION DURING THE HELA S-3 CELL CYCLE. *(E.)*

Borun, T. W. (Temple Univ. Sch. Med., Phila., Pa.), W. K. Paik, H. W. Lee, D. Pearson and D. Marks. *Cold Spring Harbor Conf Cell Proliferation* 1:701-717, 1974.

The nature of histone methylation and phosphorylation during the HeLa S-3 cell cycle was investigated to determine the function of these modifications in continuously dividing malignant cells. Cell samples were pulse-labeled with a mixture of L-[methyl-^{3}H] methionine and L-[1-^{14}C]methionine. Histone methylation went on throughout the cell cycle but accelerated in late S and G_2, probably in order to methylate newly synthesized histones up to some necessary or or desirable level while they were in place on premitotic chromosomes. Histone lysine methylation increased due to increased synthesis of HeLa protein methylase III molecules. Histone F_1 was not methylated at all. Histones f_{2a1} and f_3 were methylated at the highest rates and to the highest levels during the HeLa cell cycle and both turned over methyl groups at a rate of 1.8% hr. Histones f_{2b} and f_{2a2} were methylated at lower rates in the HeLa cell but also had a lower methyl group turnover rate. There were at least two distinct kinds of histone phosphorylation in the HeLa S-3 cell. Histones f_{2a1} and f_{2b} incorporated ^{32}P throughout the cell cycle at rates that were proportional to the amount of these polypeptides, and once incorporated this label rapidly turned over. These phosphorylations were neither coupled with DNA replication nor obviously related to increased RNA synthesis during the cell cycle. The second kind of phosphorylation occurred in histone f_1 polypeptides and was partially coupled with DNA replication. The f_1 phosphorylation rate increased about tenfold as the cell passed from G_1 into S and was reduced to 50% of its normal value if DNA replication was inhibited in S phase. The resolution of three different forms of histone f_1 molecules by acrylamide gel electrophoresis and an analysis of the changes in the relative proportions of these forms through the HeLa S-3 cell cycle confirm and considerably expand the ^{32}P-labeling data.

5878 CONTROL OF GROWTH AND DIFFERENTIATION IN NORMAL HEMATOPOETIC AND LEUKEMIC CELLS.
E.) Sachs, L. (Dep. Genet., Weizmann Inst. Sci.,
ehovot, Israel). *Cold Spring Harbor Conf Cell
roliferation* 1:915-925, 1974.

sing an *in vitro* cloning assay for normal hemato-
oietic cells, the development of colonies in which
ormal undifferentiated blast cells differentiate
nto mature macrophages or granulocytes was shown
o require a protein inducer (MGI) which can be ob-
ained from medium conditioned with fibroblasts.
GI, which has a molecular weight of 68,000 daltons,
as purified and labeled by acetylation without
oss of biological activity. MGI required a small
olecular weight cofactor which is also present in
onditioned medium; adenine can be used as a sub-
titute for this cofactor. MGI can induce normal
ifferentiation (D^+) in some human and murine mye-
oid leukemic cells, while other myeloid leukemic
ells (D^-) are not similarly inducible. D^+ leu-
emic cells have been induced to differentiate into
th macrophages and granulocytes, and normal dif-
rentiation has been induced even in cells which
re no longer diploid. D^- cells can segregate some
progeny and D^+ cells can segregate some D^- pro-
ny. D^+ and D^- cells differ in the mobility of
nA binding sites on the surface membrane. This
perimental system can be used in the further elu-
dation of the genetic and chemical control over
rmal differentiation in leukemic cells.

79 CONTROL OF FIBROBLAST PROLIFERATION. *(E.)*
Houck, J. C. (Child. Hosp. Dist. Columbia,
shington, D.C.), R. F. Cheng and V. K. Sharma. *Natl
cer Inst Monogr* 38:161-170, 1973.

The isolation and purification of a serum factor which permits the *in vitro* mitosis of diploid human fibroblasts is described, as is an extract of diploid human fibroblasts which inhibits fibroblast mitosis *in vitro*. The stimulating factor was isolated from calf serum using Diaflo ultrafiltration membrane units, iso-electric focusing, and preparative gel electrophoresis. This factor stimulated cell growth in two human cell lines, WI-38 and GWF; it also decreased the generation time in SV40-transformed WI-38 cells. The serum-derived component or fibroblast mitogen, having a molecular weight of about 120,000 daltons, was thermostable at 56 C for 30 min, was inactivated by trypsin and neuraminidase, contained 1.2% sialic acid and contained 3.4% total carbohydrates. Similar fibroblast mitogenic materials were isolated from the sera of fetal calf, cow, horse, and human. These factors were inactivated by DEAE- and CM-cellulose column chromatography and during preparative acrylamide gel electrophoresis at a current of 150 mA. The inhibitory factor, isolated from sonically disrupted human fibroblasts, strongly inhibited the incorporation of thymidine-^3H by diploid human fibroblasts, but had no effect on the thymidine-^3H uptake of HeLa cells or phytohemagglutinin-stimulated diploid human lymphocytes. The molecular weight of this material was between 30,000 and 50,000 daltons and its iso-electric point was between 3.5 and 4.3. It was thermolabile at 50 C, its activity was destroyed by trypsin digestion, and it was not cytotoxic for fibroblasts. The results suggest that fibroblast mitosis may be under chalone control, and that the mitogenic serum factor may displace the chalone from its binding site on the cell.

5880 PLASMA MEMBRANE INTERACTIONS AND THE CONTROL OF CELL DIVISION. *(E.)* Allison, A. C. (Clin. Res. Cent., Harrow, England). *Cold Spring Harbor Conf Cell Proliferation* 1:447-459, 1974.

In multicellular organisms cell division and differentiation are controlled not only by mechanisms operating within individual cells but also by influences spreading from cell to cell. Apart from the long-range effects exerted by hormones and nerve impulses, electrical stimuli and small molecules, but not macromolecules, travel freely among adjacent cells. In addition many plant and invertebrate cells and some mammalian cells are linked by true cytoplasmic bridges. Although the physiological roles of such junctional systems are poorly understood, they seem to be involved in the short-range control of cell division. The mobility of proteins within membranes, the properties of ionophores and the disposition of particles visualized in membranes by freeze-fracturing electron microscopy provide clues to the structural basis of junctional communication between cells. An important mechanism limiting the multiplication of malignant cells is that exerted by the immune system. This is illustrated by the raised incidence of tumors, especially those that are virus induced, in immunosuppressed animals and human subjects. Immunological surveillance is linked to the capacity of immunocompetent cells to kill tumor cells or other target cells with antigens different from those in the host animals. The mechanism of target cell killing by sensitized lymphocytes is similar to that allowing functional coupling between many different cell types. Observation by freeze-etching and fracturing of clusters of proteins in gap junctions and in synapses seem to indicate the possibility that membrane protein interactions can have two consequences: establishment of "functional coupling" between cells and complete membrane fusion.

5881 THE YIN YANG HYPOTHESIS OF BIOLOGICAL CONTROL: OPPOSING INFLUENCES OF CYCLIC GMP AND CYCLIC AMP IN THE REGULATION OF CELL PROLIFERATION AND OTHER BIOLOGICAL PROCESSES. *(E.)* Goldberg, N. D. (Univ. Minnesota Med. Sch., Minneapolis), M. K. Haddox, E. Dunham, C. Lopez and J. W. Hadden. *Cold Spring Harbor Conf Cell Proliferation* 1:609-625, 1974.

The possible regulatory role of cyclic 3',3'-guanosine monophosphate (cyclic GMP) in the control of cell proliferation and other cellular events was investigated. Changes occurred in human lymphocyte cyclic nucleotide levels following phytohemagglutinin-induced mitogenesis. The concentrations of cyclic GMP in these cells increased over 10-fold within 20 min of stimulation. The levels of cyclic AMP were increased about 70-80% when a relatively impure preparation of phytohemagglutinin which exhibited agglutinating activity was used, but were unaltered when a more purified preparation with minimal agglutinating activity was used. Increases in lymphocyte cyclic GMP concentration over 10-fold with no accompanying alteration in cyclic AMP levels were also found after stimulation with concanavalin A. Cyclic GMP stimulated [^{3}H]uridine incorporation into RNA in isolated lymphocyte nuclei. The stimulation was detectable with extremely low concentrations of the cyclic GMP in stimulating the process; the peak effect occurred at a concentration of cyclic AMP (10^{-6} M) that was 10^4-fold greater than that found with cyclic GMP. Changes occurred in the concentration of cyclic GMP after insulin treatment of confluent monolayers of mouse 3T3 fibroblasts. There was a concentration-dependent increase in the levels of this cyclic nucleotide 20 min after exposure to the hormone, ranging from about 10- to 40-fold with concentrations of insulin from 0.1 to 1000 U/ml. With 19 U/ml an increase of about 10-fold was detected three min after exposure, and by 20 min the concentration of cyclic GMP was 20-fold greater than the control. The results suggest that cyclic GMP actually mediates the mitogenic signal or the hormone-induced alterations in cell function.

5882 THE MELANOCYTE CHALONE. *(E.)* Dewey, D. L. (Mt. Vernon Hosp., Northwood, England). *Natl Cancer Inst Monogr* 38:213-216, 1973.

The activity of a melanocyte chalone isolated from extracts of Harding-Passay melanoma grown in mice was studied by adding known volumes of extract to 1-2 X 10^4 melanoma cells growing in a plastic tissue-culture flask. After 6-10 days incubation, the cells were removed, centrifuged, resuspended in saline, and counted in a blood cell counting chamber. Increasing amounts of extract produced decreases in the growth rate of cultured Harding-Passey melanoma cells although the dose-effect curve was not a straight line. The activity of the chalone was abolished by treatment with either trypsin or chymotrypsin for 1 hr at 37 C. It was also thermolabile at 50 C and was inactivated by neuraminidase. Fractionation on Sephadex G-25 columns yielded two fractions: one was fast-moving with a molecular weight over 10,000 daltons and the other had an apparent molecular weight under 2,000 daltons. The substance is quickly destroyed by temperatures over 50 C or by trypsin, chymotrypsin and neuraminidase. The results suggest that the melanocyte chalone is a glycoprotein and is the smallest chalone yet described.

5883 ANTICHALONE: A THEORETICAL TREATMENT OF THE POSSIBLE ROLE OF ANTICHALONE IN THE GROWTH CONTROL SYSTEM. *(E.)* Bjerknes, R. (Inst. Phys., Univ. Oslo, Norway) and O. H. Iversen. *Acta Pathol Microbiol Scand* [*A*] (Suppl 248):33-42, 1974.

The interaction between a possible antichalone and the S-factor chalone in growth control in the epidermis is discussed theoretically. There is no exact and detailed knowledge about the mechanism of action of the epidermal chalone. Relatively small alterations in chalone production provoke quick and rather large changes. Removal or damage of a few surface cells leads to a pronounced increase in mitotic activity. This leads to the assumption that some other mechanisms must be involved. It is proposed that this addition mechanism may be a sort of antichalone and that the introduction of a possible antichalone will make the change in chalone concentration at the site of the basal cells relatively larger than without antichalone. The different modes of action of the chalone itself seem not to influence the general trend. Chemical instability of the chalone could possibly have the same effect. It is emphasized than an antichalone need neither be tissue-specific nor a direct antagonist to a chalone. Any chalone-binding mechanism and any growth-stimulating factor may lead to the same effect. Growth stimulatory factors are multiple and well known, ranging from hormones to serum factors known to be necessary for growth in tissue culture. It is thus assumed that growth regulation is an interplay between tissue-specific growth inhibitors and influences acting the opposite way, provisionally called antichalones.

5884 SELF-LIMITATION OF ASCITES TUMOR GROWTH: A POSSIBLE CHALONE REGULATION. *(E.)* Bichel, P. (Cancer Res. Inst., Danish Cancer Soc., Radiumstn., Aarhus, Denmark). *Natl Cancer Inst Monogr* 38:197-203, 1973.

To help determine the causes of the balanced growth of the advanced ascites tumor, the effect of cell-free ascitic fluid from old ascites tumors on recurrent growth was investigated *in vivo*. Samples of cell-free ascitic fluid from JB-1 ascites plasmacytomas at the growth plateau and Colcemid (i.p.) were simultaneously injected into mice bearing JB-1 ascites tumors in recurrent growth. By means of repeated aspirations of small samples of the ascites tumor, the accumulation of cells in mitosis was followed for 4-5 hr after the Colcemid injection. For the first 2.5 hr, the increase in the number of mitoses was identical in the mice injected with ascitic fluid and in the noninjected controls. From 2.5-4 hr after the injection, there was a complete cessation in the flux of cells to mitosis. Then 4 hr after the injection of ascitic fluid, a sharp rise in the accumulation curve was observed. Repeated injections of the acellular ascitic fluid at 1.5-hr intervals were followed by prolonged arrest of the tumor cells, corresponding to the number of injections. The thymidine-^{3}H labeling index in JB-1 ascites tumors in recurrent growth following the injection of cell-free ascites fluid indicated that the cell-free ascitic fluid induced inhibition of the cells in both the G_1 and G_2 phases of the cell cycle. The author suggests that increasing age or size of the ascites tumor is followed by an inhibition of the cells in these two phases of the cycle.

5885 CHALONE OF THE GRANULOCYTE SYSTEM. *(E.)* Rytömaa, T. (II Dep. Pathol., Univ. Helsinki, Finland). *Natl Cancer Inst Monogr* 38:143-146, 1973.

Current knowledge concerning the granulocytic chalone and its mode of action is reviewed. Evidence that the granulocytic chalone is tissue specific for granulocytic cells is indicated by the fact that only the DNA synthesis in the granulocytic cells within rat bone marrow cultures were significantly inhibited by the chalone, the other cell types being unaffected, and DNA synthesis in diffusion chamber cultures of proliferating granulocytes, but not cultures of proliferating immunoblasts or macrophases, were inhibited by the chalone. In each case, the chalone effect on the granulocytic cells was statis- ically significant, and in the diffusion chamber tudies, the viability of the cultured granulocytes was unaffected by the chalone. It has also been ound that prolonged, intensive treatment of chloro- eukemic rats with the granulocytic chalone depressed eukemia cell proliferation but did not result in he inhibition of cell proliferation in nongranulo- ytic cell lines. The granulocytic chalone is not pecies specific and its effect on DNA synthesis is both short-term and reversible. It is present in ature and immature granulocytes and also appears o be synthesized within these cells.

886 GRANULOPOIESIS-INHIBITING FACTOR: DEMONSTRATION AND PRELIMINARY CHEMICAL AND BIO- OGICAL CHARACTERIZATION OF A SPECIFIC POLYPEPTIDE CHALONE). *(E.)* Paukovits, W. R. (Inst. Cancer es., Univ. Vienna, Austria). *Natl Cancer Inst onogr* 38:147-155, 1973.

e biological activity of a highly purified granu- poiesis-inhibiting factor (GIF) was investigated. moral bone marrow from two month old female rats s incubated in medium containing amino acids and C-labeled protein hydrolysate and/or ^{3}H-leucine. The cells were removed by centrifugation and the supernatant, along with a rat spleen supernatant, was subjected to ultrafiltration, column chromatography, paper electrophoresis, and thin-layer chromatography. The chromatographic fractions were subjected to amino acid analysis and screened for inhibitory activity against the incorporation of ^{3}H-thymidine into rat bone marrow cells *in vitro*. A polypeptide with granulopoiesis-inhibiting properties was isolated from both the bone marrow-conditioned medium and the spleen supernatant fraction. When guinea pig bone marrow was fractionated and the effects of the GIF on the various fractions tested, DNA synthesis was inhibited only in the fraction containing almost pure granulocytic precursor cells. Double-labeling experiments indicated that GIF inhibited DNA synthesis in essentially the whole range of granulopoietic precursor cells, with broad minima occurring in the isotope ratio curve at 4 mm/hr (myeloblasts or promyelocytes) and 11 mm/hr (CFU-C). The results indicate that the GIF may be identical with the granulocytic chalone.

5887 REGULATION OF HYALURONIC ACID SYNTHESIS IN CULTURED MAMALIAN CELLS: ITS RELATION TO CELL GROWTH AND 5-BROMODEOXYURIDINE EFFECT. *(E.)* Ono, T. (Cancer Inst., Tokyo, Japan), H. Koyama and M. Tomida. *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* 401-414, 1973.

A hybrid cell line (B-6), able to produce hyaluronic acid, was induced by somatic cell hybridization of mouse mammary carcinoma and Chinese hamster lung cells and was maintained *in vitro*. Studies on the expression of this function demonstrated that morphological differentiation was not always a prerequisite for functional differentiation, hyaluronic acid synthesis occurred only during the exponential growth phase and the expression of this function was mainly regulated at the level of hyaluronic acid synthetase activity with a short half-life and oscillatory change during the growth phase. The inhibitory effect of 5-bromodeoxyuridine (BrdU) on the differentiation was found both in the content of hyaluronic acid secreted and in the synthetase level. The inhibition was not all or none, was completely reversible and required the incorporation of the analog into the cell DNA, in agreement with the inhibition of differentiation by BrdU in other systems. Considering these facts, the mechanism of the BrdU effect may be interpreted as a preferential reduction of the transcription rate of genes for hyaluronic acid synthetase with a high turnover rate of the enzyme.

5888 CELL SURFACE AND GROWTH CONTROL OF CHICK EMBRYO FIBROBLASTS IN CULTURE. *(E.)* Vaheri, A. (Dep. Virol., Univ. Helsinki, Finland), E. Ruoslahti and T. Hovi. *Cold Spring Harbor Conf Cell Proliferation* 1:305-312, 1974.

Molecular mechanisms operative in growth and regulation phenomena were studied in density-inhibited cultures of chick embryo fibroblasts. The density-inhibited fibroblasts responded with proliferation to the addition of serum, trypsin, or papain; in addition, microgram amounts of insulin released the cells from the G_1 phase in an almost synchronous wave of proliferation. Under conditions giving maximal proliferation, less than 0.002-0.2% insulin was taken up by the cells, indicating that interaction with the cell surface may be sufficient to activate the resting cell. As little as 100 pg/ml lipopolysaccharide stimulated density-inhibited fibroblasts, as did small amounts of pokeweed lectin and tuberculin. These results suggest that cells possess high-affinity mitogen receptors through which events leading to proliferation can be triggered in a highly specific way. The effects of insulin and trypsin were reversible, but the effects of the lymphocyte mitogens were largely irreversible. Added cyclic AMP and other purine nucleotides enhanced the growth of chick embryo fibroblasts, and intracellular cyclic AMP levels did not alter when the cells were released from density-dependent inhibition. An increase in intracellular cyclic guanosine monophosphate seemed to accompany initiation of proliferation in chick embryo fibroblasts. Differences in the response of chick embryo fibroblasts and murine 3T3 cells to cyclic AMP suggest that variations in surface-mediate regulatory mechanisms exist between different cell types. In a related study, proteolytic digestion was used to solubilize proteins from the surface of chick or human embryo fibroblasts. Immunochemical study of the released material led to identification of a major fibroblast-specific cell surface protein that is also present in homologous serum.

5889 QUANTITATIVE STUDIES ON THE DEVELOPING VASCULAR SYSTEM OF RAT HEPATOMA.

(E.) Yamaura, H. (Res. Inst. Tuberc., Lepr., Cancer, Tohoku Univ., Sendai, Japan) and H. Sato. *J Natl Cancer Inst* 53(5):1229-1240, 1974.

The progression of vascularization of a thin sheet of rat ascites hepatoma tissue grown in a newly designed transparent chamber implanted s.c. in Donryu rats can be followed. Vessel frequency, lumen diameter, blood volume and surface area were measured in this system at various stages of tumor growth. The first stage, 4-5 days after tumor transplantation, consisted of enlargement and cross connection of capillaries to form a network. By 8-12 days the chamber was filled with tumor cells and new capillaries formed among them; at the same time the venous lumen enlarged irregularly and blood flow appeared to vary within them. Next, the artery walls became thin and the lumens widened irregularly. Blood flow was erratic and red cells lay in static pools or even in strands. The fourth and final stage of tumor necrosis caused hemorrhage and blockage of many vessels while the entire chamber was filled with necrotic cells devoid of any vasculature (about four weeks after tumor implantation). Vascular volume of tumor vessels increased from 20% of tissue volume to 50% (end of second stage) then decreased rapidly during necrosis. Vascular length/nm^3 and vessel surface area similarly increased and decreased while the average vessel diameter enlarged. The evidence obtained from this study model is cited in support of the concept of tumor growth as a cell loss/cell gain system with a net positive gain.

5890 GLUCOCORTICOID CYTORECEPTORS IN NORMAL AND TUMOR TISSUES OF RAT LIVER.

(Rus.) Shittabe, K. (Biol. Fac., Moscow Univ., USSR), A. G. Volchek, V. V. Adler and V. B. Rosen. *Vopr Med Khim* 20(6):625-631, 1974.

Studies were carried out on the livers of randombred albino rats with Zajdela ascites hepatoma to investigate the cytoplasmatic and nuclear receptors of the tumor; cell receptors of the rat liver with ascites hepatoma; and the main binding parameters of receptor proteins in the cytoplasm and nucleus of the liver of intact rats. The cytoplasm of intact rat liver has a corticosteroid-binding system of three macromolecular components with association constants of the order of 10^{11}, 10^{8} and 10^{7} M^{-1}, resp. The first two components were assumed to be cytoplasmic receptors of the liver cell as they demonstrated high specific affinity for physiologically active corticosteroids; the concentration of their binding groups corresponded to physiological concentrations of glucocorticoids in the cells. The third component was shown to be a nonspecific binding factor. The liver cell nuclei contained only two macromolecular components with association constants of 10^{11} and $<10^{7}$ M^{-1}. It is suggested that the former component is a nuclear receptor of the liver cell, while the latter is a nonspecific binding factor. No specific receptor macromolecules were found in either the cytoplasm or nuclei of Zajdela ascites hepatoma cells, suggesting that these malignant cells have become resistant to glucocorticoids. In addition, no cytoplasmic or nuclear receptors were detected in the livers of rats with Zajdela ascites hepatoma; only a nonspecific binding factor was present. It is suggested that the disappearance of glucocorticoid receptors and possibly the hormone resistance of the liver may be due to a toxic effect produced by the rapidly developing ascites hepatoma which killed rats 10 days after transplantation.

5891 ASSOCIATION OF POLYANION RESISTANCE WITH TUMORIGENICITY AND OTHER PROPERTIES IN BHK/21 CELLS.

(E.) Clarke, G. D. (Imp. Cancer Res. Fund Lab., London, England), M. Shearer and P. J. Ryan. *Nature* 252(5483):501-503, 1974.

The correlation between resistance of clonal sublines to dextran sulfate and high tumorigenicity, serum independence and growth in suspension was studied in normal hamster BHK/21 cells. The growth of normal BHK/21 cells was completely inhibited by 2 μg/ml dextran sulfate, while that of polyoma transformed cells was only marginally affected by 50 μg/ml. Quiescent BHK/21 cells reacted with dextran sulphate in the absence of serum in a manner that inhibited their response to serum, indicating that it also was bound to the cells. The results with the variants suggested that resistance to dextran sulfate was correlated with a tendency to grow in suspension, independence of serum growth factors and high tumorigenicity. The authors postulated that dextran sulphate binds to the cell membrane so as to block the interaction with the macromolecular growth factors in serum and to block temporarily the interaction with the solid substrate.

5892 BINUCLEAR CELLS IN THE MECHANISM OF POLYPLOIDIZATION IN EHRLICH'S ASCITES TUMOR DURING HETEROTRANSPLANTATION. *(Pol.)* Dux, K. (Dep. Biol. Neoplasms, Inst. Oncol., Warsaw, Poland), P. Janik, A. Czarnomska and U. Bregula. *Nowotwory* 24(2):75-82, 1974.

Cells of a hyperdiploidal (10% polyploid) clone of Ehrlich's ascites tumor E4 maintained on RIII/W mice were serially heterotransplanted every five days into rats, and cytogenetic studies were made during each passage. After ten passages the percentage of tetraploidal cells increased from 12.2 to 80.2, of cells of higher ploidy, from 0.4 to 9.6; of binuclear cells, from 1.15 to 2.2; of cells with more than two nuclei, from 0.2 to 0.45. During that time endoreduplication did not change significantly. In a separate series of experiments ^{3}H thymidine was injected into mice (25 µCi) and rats (100 µCi) which had been injected five days previously with Ehrlich's ascites tumor cells. Autoradiographic studies were made one hr, one, two and three days later. Approximately 50% of all cells were labeled. In rats one hour after injection of tritiated thymidine, 1.6% of binuclear cells showed asynchronous DNA replication (only one nucleus being labeled); after one day, the percentage increased to .2%; after an additional day, to 5.5%. The number of cells in which both nuclei were either labeled or nlabeled did not change. In mice one hour after in-ection of tritiated thymidine, 0.18% of binuclear ells showed asynchronic DNA replication; 1.2%, after ne day. It is suggested that fusion of cells may e a mechanism for development of binuclear cells hich serve as an intermediate stage in the develop-ent of polyploidal cells.

393 CELLULAR COMMUNICATION BY PERMEABLE MEMBRANE JUNCTIONS. *(E.)* Loewenstein, W. R. Jniv. Miami Sch. Med., Fla.). *Misc Hosp Pract* 9 l1):113-122, 1974.

ie role of permeable cell membrane junctions is alyzed with respect to intracellular communication growth control. All normal cells, except for eletal muscle and neurons, possess membrane or ap junctions' which allow cell-to-cell passage of all molecular weight molecules (1000-10,000). The thor proposes that probably all parts of the plasma mbrane are capable of forming these channels, the rmeability of which falls with increasing intra-llular free calcium concentration. In attempts to rther characterize the role gap junctions play in ntrol of cell growth and differentiation, their operties have been studied in cultured cancer-oducing cells and in hybrids between these and rmal animal and human cells. The ability of malig-nt cells to couple to one another is generally cking. Correlated with this is loss of ability to ansfer small ions, fluorescein, or labeled nucleo-ies. When these cells are hybridized with normal imal or human cells possessing gap junction-forming operties, all these functions as well as the ex-ession of contact-inhibition of growth are re-ored. These results suggest a genetic basis for phenomenon as well as a yet unknown role of mem-ne gap junction in the control of cell growth.

5894 PHOSPHORYLATION OF CHROMOSOMAL AND RIBOSOMAL PROTEINS AND INTRACELLULAR LEVELS OF CYCLIC 3',5'-ADENOSINE MONOPHOSPHATE AND CYCLIC 3',5'-GUANOSINE MONOPHOSPHATE DURING AMINO ACID STARVATION IN LANDSCHUTZ TUMOUR CELLS. *(E.)* Jolicoeur, P. (Hosp. Cent., Laval Univ., Quebec, Canada), A. Lemay, F. Labrie and A. L. Steiner. *Exp Cell Res* 89(2):231-240, 1974.

The effects of short-term amino acid starvation on the level of phosphorylation of chromosomal and ribosomal proteins in Landschutz cells was studied, along with the effects on the intracellular concentrations of cyclic GMP and cyclic AMP. The histones, nuclear acidic proteins, nucleotides and ribosomal proteins were extracted from Landschutz cells incubated for 2-3 hr in amino acid-deficient media containing ^{32}P-orthophosphate. Amino acid starvation resulted in a 2-fold stimulation of the phosphorylation of three of the 13 major bands of nonhistone nuclear proteins, with a more reduced level of stimulation being observed with four other bands. There was no effect on the phosphorylation of the higher molecular weight components. Short-term amino acid starvation also led to a 20-30% increase in the level of incorporation of ^{32}P into the five cellular histone species, but ribosomal protein phosphorylation was not stimulated. Similarly, the labeling of ATP and GTP was not significantly affected by incubation in amino acid-deficient media. There was no accumulation of ppGpp in the Landschutz cells incubated in either complete or amino acid-deficient media. Although incubation in amino acid-deficient medium resulted in a significant decrease in the levels of cGMP, there was no significant effect on the intracellular concentration of cAMP. These results suggest an inverse correlation between the level of phosphorylation of certain acidic proteins and the rate of rRNA synthesis, and indicate that histone phosphorylation is independent of protein synthesis. Although these data establish no direct causal relationship, cGMP may mediate some of the events of the pleiotypic response.

5895 DETECTION AND QUANTITATIVE CHARACTERISTICS OF PROTEIN WHICH APPEARS IN BLOOD SERUM OF RATS WITH LEUCOSIS. *(Ukr.)* Senchurin, E. V. (A. V. Palladin Inst., Biokhim., U.S.S.R.), O. P. Ivanov and V. P. Korotkoruchko. *Ukr Biokhim Zh* 46(5):745-753, 1974.

A special precipitation method developed for determining protein occurring in the blood serum of rats having Shvetz leucosis ("BPR-ORL") is discussed. The method is based on a very similar method applied earlier by members of the same research team for determining protein occurring in the blood serum of cancerous rats ("BPR-ORR") reacting positively with perchloric, nitric, hydrobromic, hydrochloric or sulfuric acids. Male rats (200-250 g) had leucosis implanted under their skin by cellular suspension. Twenty-four hours before their decapitation, the infected animals were kept on a strict diet. The "BPR-ORL" was determined in the following manner: to 0.1 ml of blood serum of infected rats, 0.15 ml of dilute (11.49%) nitric acid was added. When precipitate formed, 20 sec after the addition of acid, 1.5 ml of distilled water was added to the reacting mixture. The precipitate that remained undissolved after addition of water was considered as 'BPR-ORL' or protein of blood serum of rats with Shvetz leucosis. The content of this protein in blood serum was determined on the sixth day after the appearance of swelling, when the blood serum of rats showed maximum intensity in precipitation reaction with nitric acid, and on the 10th day after the swelling appeared, when the infected animals began to die. Using other inorganic acids ($HClO_4$, HBr, HCl and H_2SO_4) their concentration and volume had to differ significantly from the concentration and volume of nitric acid. The final pH of reacting medium also differed considerably with each different acid used. In using different acids for precipitation of 'BPR-ORL', it was observed that 'BPR-ORL' had a tendency to form aggregates with other protein fractions, which was not the case with protein from the blood serum of healthy rats. The amount of these aggregates differed for each particular acid used. The relationship between the quantity of aggregate formed and the acid used is formulated as follows: the amount of aggregates of protein positively reacting in the precipitation test for leucosis with other protein fractions is in direct dependence on the affinity of an anion of the mentioned acids to proteins. The order of such affinity runs thus: $HClO_4>HNO_3>HBr>HCl>H_2SO_4$.

5896 STUDIES ON A MAMMALIAN CELL MUTANT WITH A TEMPERATURE-SENSITIVE LEUCYL-tRNA SYNTHETASE. *(E.)* Stanners, C. P. (Ontario Cancer Inst., Toronto, Canada) and L. H. Thompson. *Cold Spring Harbor Conf Cell Proliferation* 1:191-203, 1974.

The cellular and molecular properties of a nonleaky, low-reverting mutant of Chinese hamster ovary cells were studied; the mutant is temperature-sensitive for protein synthesis and has a specific temperature-sensitive defect in the charging of tRNA with leucine. In a cell-free system using crude cytoplasmic extracts, the activity of the leucyl-tRNA synthetase was low and temperature sensitive. The extent of the depression in protein synthesis could be modified by temperature and by the external concentration of leucine, being greater for higher temperatures and lower leucine concentrations. At 38.5 C, a marked increase occurred in the proportion of free ribosomes and a decrease in the proportion of ribosomes bound to polysomes. This effect is similar to that in mitotic cells, cells starved for amino acids, and for cells in stationary phase; it is apparently due to a reduced attachment probability of ribosomes to mRNA. The transit time of the ribosomes across mRNA in polysomes increased with increasing temperature. At 39.5 C, many polypeptide chains terminated prematurely, resulting in the generation of polypeptide fragments. Turnover of preexisting proteins was normal at nonpermissive temperatures. Since the degradation of proteins can exceed the rate of synthesis, this might account for the cell death and disintegration observed under these conditions. Preliminary experiments indicate that polypeptide fragments generated at 39.5 C are rapidly degraded and that turnover rates are normal in normal-length polypeptides synthesized under nonpermissive conditions. A preliminary survey of possible couplings in mutant cells suggest a tight coupling between expression of the lesion and thymidine incorporation and no coupling with uridine incorporation. No guanosine tetraphosphate or other unusual nucleotides were detected under permissive or nonpermissive conditions.

5897 STUDIES ON HEXOSAMINE-CONTAINING MACROMOLECULES IN THE WALL OF THE GASTROINTESTINAL TRACT OF THE RAT: WITH ADDITIONAL OBSERVATIONS ON SOME PATHOLOGICAL SPECIMENS OF THE HUMAN STOMACH AND COLON. *(E.)* Terho, T. (Dep. Physiol., Univ. Turku, Finland). *Ann Acad Sci Fenn* [*Chem*] 175:13-16, 64-80, 1974.

The hexosamine-containing substances of the wall of the gastrointestinal tract of man were isolated, purified, and characterized. Proteolysis, cetylpyridinium chloride (CPC) precipitations in different electrolyte concentrations, molecular sieve chromatography, fractionation on CPC-cellulose columns, and chromatography on Ecteola anion exchange cellulose were used in the isolation procedure. In the wall of the human stomach, both ulcerous and carcinomatous, the main fraction of glycopeptides was CPC-soluble and of high molecular weight. The glycopeptides were fractionated with Ecteola, and component sugars were separated and quantitated with ion-exchange chromatography. Most of them were not attached to Ecteola, but eluted from columns with water. Fractions that were eluted with water and 0.1 M NaCl and isolated from the carcinomatous human stomach were identical to corresponding normal fractions. Chondroitin sulfates and dermatan sulfate comprised about 20% of the total acid glycosaminoglycans in the ulcerous human stomach, but in the carcinomatous stomach their concentrations were twice as high. L-fucose, L-arabinose, D-glucose, and D-galactose were identified from fractions of acid glycosaminoglycans isolated from the carcinomatous human stomach.

5898 RELATIONSHIPS BETWEEN NUCLEAR PROTEIN PHOSPHORYLATION AND GENE ACTIVATION IN THE CELL CYCLE OF SYNCHRONIZED HELA S-3 CELLS. *(E.)* Allfrey, V. G. (Rockefeller Univ., New York, N.Y.), J. Karn, E. M. Johnson and G. Vidali. *Cold Spring Harbor Conf Cell Proliferation* 1:681-700, 1974.

The uptake and turnover of ^{32}P-phosphate in the phenol-soluble, nuclear acidic protein of synchronously growing HeLa S-3 cells was studied in detail. Synchronization was achieved by the double thymidine block method, and the cell cycle was monitored by measurements of cell concentration, mitotic index, and (^3H)thymidine incorporation rate. The phosphoprotein fraction of the cells was complex, containing proteins ranging in molecular weight from 18,000-170,000 Daltons. The relative concentrations of the major protein bands did not change appreciably during the cell cycle, but the ratio of acidic protein to DNA increased during G_1 and dropped in the late S phase. Protein phosphorylation was most active during periods of maximum RNA synthesis (G_1 and S), and was minimal when RNA synthesis was suppressed (G_2-M). These changes were not due to changes in the specific activities of the cellular ATP pools, which remained relatively constant; they probably reflected alterations in nuclear protein kinase activities at different phases of the cycle. The phosphorylation of histones also varied during the cell cycle. Maximum rates of ^{32}P incorporation were observed in mid-S, at the peak of DNA synthesis; the peak of phosphorylation of the nonhistone proteins occurred somewhat earlier. Moreover, unlike the nuclear acidic protein fraction, the histone showed no phosphorylation peak in G_1. The activation of histone F1 phosphorylation by cyclic AMP was highest in early S and lowest in early M. Phosphate incorporation into the nuclear acidic proteins varied from one protein species to another, the phosphate groups being subject to exchange without degradation of the polypeptide chain. If the nuclear phosphoproteins play a role in the control of transcription during the cell cycle, changes in their phosphorylation would offer a mechanism for modifying their structure and influencing their interactions with other chromosomal components. If their primary role is structural, changes in phosphorylation would affect their binding to histones. In a nondifferentiating cell population, changes in phosphate uptake and turnover may be more important than changes in the relative concentrations of the individual protein species.

5899 IMMUNOHISTOLOGICAL DEMONSTRATION OF SERUM GLYCOPROTEIN ATTACHED TO CARCINOMA CELL SURFACE.

(E.) Kawasaki, H. (Kurume Univ. Sch. Med., Japan), H. Nei and E. Kimoto. *Gann* 65(5):447-449, 1974.

The role of the cell surface, including surface charge density, in the biologic behavior of malignant cells has been of recent research interest. Direct immunofluorescent demonstration of serum glycoproteins was carried out on gastric carcinoma cells; seromucoid fraction was obtained from normal adult sera. Immunofluorescent smears were prepared from peritoneal fluids of gastric cancer-bearing patients. Fluorescence appeared localized at the plasma membrane region of carcinoma cells against a dark background of inflammatory cells; this suggests that seramucoid acts as a plasma membrane constituent or as a component lying firmly at the carcinoma cell surface. Immunofluorescence staining on tissue sections of gastric carcinoma did not show a clear-cut distribution of seromucoid. These findings suggest that interactions take place between some of the hepatogenic serum glycoproteins and gastric carcinoma cells.

5900 KINETIC STUDY OF THE PHYSICOCHEMICAL PROPERTIES OF NORMAL AND TUMOR DNA.

(Rus.) Zhizhina, G. P. (Inst. Chem. Phys., Moscow, U.S.S.R.), S. I. Bobovich, O. E. Petrov and K. E. Krugliakova. *Dokl Akad Nauk SSSR* 217(3):722-725, 1974.

Comparative studies were performed on the stability of the secondary structures of DNA in normal and tumor tissues from the spleen of intact mice, the spleen of mice with continuous La leukemia (DNAl), and the cells of Erlich ascites carcinoma (DNAa). The kinetic formaldehyde method employed in the studies showed that the concentration of locally denatured areas in DNAl and particularly in DNAa was higher than in the normal DNA. The specimens were then exposed to X-rays with subsequent study of the despiralization curves. The data indicate that normal DNA and DNAl sustained approximately equal damage while the damage done to DNAa was far more severe. The results show that tumor DNA has a greater number of secondary structure defects, while DNAa exhibits a higher susceptibility to radiation. The differences in the stability of the secondary structures of tumor and normal DNA may be essential for selecting physical and chemotherapeutical treatment.

5901 AMINO ACIDS AND THE CONTROL OF NUCLEAR DNA REPLICATION IN LIVER.

(E.) Short, J. (Univ. Pittsburgh Sch. Med., Pa.), N. B. Armstrong, M. A. Kolitsky, R. A. Mitchell, R. Zemel and I. Lieberman. *Cold Spring Harbor Conf Cell Proliferation* 1:37-48, 1974.

Induction of DNA synthesis and mitosis was studied in protein-deficient and/or partially hepatectomized female albino rats. In protein-deficient animals after 70% hepatectomy, increases in DNA synthesis and mitotic cells were similar to those in well-fed, partially hepatectomized rats. When unoperated rats were shifted from a protein-free to a diet containing protein or amino acids, DNA replication and cell division took place in hepatocytes. Isoleucine, threonine, and valine were essential for hepatic DNA synthesis in protein-deficient animals; moreover, the essentiality of isoleucine and valine did not stem from a block in the intestinal or hepatic uptake of the limiting endogenous amino acid by other branched chain compounds. In both protein-deficient and partially hepatectomized animals, stimulation of hepatic DNA synthesis appeared to depend on the capacity of the liver to metabolize an excessive amino acid burden. Feeding of a high-protein diet to these animals resulted in disturbances in hepatic pools of some free animo acids and other ninhydrin-positive compounds; also, up to 50 times more radioactivity than in normal liver was found in a variety of anionic intermediates labeled with tritiated amino acids (e.g., tryptophan and methionine). The mechanism by which amino acids cause nuclear hepatic DNA synthesis is not clear; and the possibility that specific amino acid catabolites trigger critical prereplicative changes is weakened by the inability of breakdown products to substitute for the amino acids themselves. Additional experiments suggested that mitochondrial protein is not involved in the regulation of nuclear DNA synthesis by amino acids.

5902 DURATION OF DNA SYNTHESIS IN GRANULOCYTES DURING ACUTE HYPERPLASIA.

(E.) Morley, A. (Dep. Med., Univ. Adelaide, Australia). *Pathology* 6(4):359-363, 1974.

The use of duration of DNA synthesis, rather than mitotic indices, confirmed results of a previous study in which granulocytic hyperplasia of Swiss mice was induced by endotoxin or irradiation. Duration of S phases were derived from mitotic indices of the various marrow cells in mice injected with ^{3}H-thymidine and killed at hourly intervals thereafter for 12 hr. Duration of S-phase in marrow cells from control or endotoxin-treated mice (50 μg/mouse i.p.) was approximately 5.3 hr in both cases. The largest increases in percent labeled cells, due to endotoxin, was 5-fold for myeloblasts, 4.3-fold for promyelocytes and 2-fold for myelocytes. Two injections of endotoxin 24 hr apart prior to ^{3}H-thymidine gave slightly larger increases in labeling indices for the three types of marrow cells. These results confirm the conclusion that hyperplasia is due to increased differentiation of precursors into granulocytes.

5903 *IN VITRO* POLYOMA DNA SYNTHESIS: INVOLVEMENT OF RNA IN DISCONTINUOUS CHAIN GROWTH. *(E.)* Hunter, T. (Salk Inst. Biol. Studies, San Diego, Calif.) and B. Francke. *J Mol Biol* 83(1):123-130, 1974.

The involvement of RNA in the synthesis of short chain DNA during polyoma DNA replication *in vitro* was studied with mouse BALB/c cells lytically infected with the temperature-sensitive polyoma mutant ts-1260. The replicative intermediates (RI) formed by this system and labeled *in vitro* with short pulses of (^{3}H)thymidinetriphosphate [(^{3}H)TTP] were heat denatured, purified, and analyzed by sucrose gradient sedimentation. The RI was found to contain two size classes of pulse-labeled DNA chains. The longer class had a broad distribution of sizes up to U length (16 S), while the smaller class had a narrower distribution around 4-5 S. Both classes were precursors to mature viral DNA. Cs_2SO_4 density gradient analysis of the labeled, heat-denatured RI showed a marked asymmetry toward higher density, this asymmetry being caused primarily by the 5 S chains. When RI simultaneously labeled with (^{3}H)TTP and all four α-^{32}P-labeled ribonucleoside triphosphates was subjected to equilibrium centrifugation in Cs_2SO_4, further evidence for the covalent linkage of RNA to the growing DNA chains was obtained. The RNA was found to be linked *via* a 5' to 3' bond to the nascent DNA chains. No absolute specificity for the last ribonucleotide or for the first deoxynucleotide was apparent. The data are compatible with the notion that all short fragments in replicating viral DNA are initiated by an RNA primer which is rather short-lived and does not exceed 30 bases in length.

5904 ISOLATION OF LYMPHOCYTE DNA SYNTHESIS-INHIBITING MEDIATOR DURING PREGNANCY AND IN CHORIOCARCINOMA IN PREGNANCY. *(Hun.)* Maraz, A. (Szeged Med. Univ., Hungary) and I. B. Petri. *Orv Hetil* 115(19):1098-1100, 1974.

The effect of soluble factors isolated from the supernatant of phytohemagglutinin (PHA)-activated lymphocyte cultures from pregnant females on lymphocyte DNA-synthesis was studied. The mediator isolated from PHA-activated lymphocytes from normal, non-pregnant females stimulated the lymphocyte DNA synthesis, as demonstrated by an increased rate of ^{3}H-thymidine incorporation. The mediator isolated from the supernatants of lymphocyte cultures from pregnant females, pregnant females with choriocarcinoma, as well as from the umbilical blood of the fetuses in normal females during delivery, inhibited DNA synthesis of the lymphocytes. The inhibitory effect was highest during the first six months of pregnancy, and in lymphocyte cultures from a pregnant female with choriocarcinoma who was not under cytostatic drug therapy at the time of the investigation. No DNA synthesis-inhibiting effect was demonstrable in blood samples taken 24 to 48 hr post partum. Mediator incubated with lymphocyte cultures without PHA did not affect DNA synthesis at all. Heat treatment at 56 C for 30 min resulted in loss of inhibiting effect of the mediator, and in the development of a DNA synthesis-stimulating effect, while heat treatment did not affect the mediator isolated from normal, non-pregnant females. Both mediators were determined to have molecular weights below 10,000, and not to be cytotoxic. The DNA synthesis-inhibiting mediator was not affected by DNase, RNase, and trypsin, while the DNA synthesis-stimulating mediator was sensitive to DNase and RNase, and resistant to trypsin. The mediators inhibiting DNA synthesis may inhibit DNA synthesis of the activated cells also *in vivo*, and they may be involved in the pathogenesis of trophoblast tumors.

5905 SYNTHESIS OF RAT LIVER RNA UNDER CONDITIONS OF PROTEIN SYNTHESIS INHIBITION BY CYCLOHEXIMIDE. *(Ukr.)* Todorov, I. N. (Inst. Mol. Biol. Genet., U.S.S.R.), A. P. Halkin, T. V. Kornyushyna, N. V., Yuhai and Y. H. Hovze. *Ukr Biokhim Zh* 46(4): 431-437, 1974.

The dynamics of changes in biosynthesis of RNA under conditions of intense inhibition of protein biosynthesis by cycloheximide was studied by studying 2-C^{14}-orotic acid incorporation into the RNA of nuclei and cytoplasmic fractions of rat liver. The experiments were performed using white male rats (150-160 g). The specific radioactivity of 2-C^{14}-orotic acid was 37 mCi/g. The antibiotic and isotopes were introduced into the abdominal cavity of experimental animals (25 μCi/100 g) one hr before killing. For isolation of subcellular structures, rat liver was homogenized in a 0.25 M solution of saccharose, and was centrifuged for ten min at 900 g. The precipitate was used for isolating the nuclei, and a mitochondrial fraction was obtained by additional centrifugation for 15 min at 6000 g. The nuclei and the supernatant remaining after precipitation of the mitochondria were treated to determine the nucleic acid content. Radioactivity was determined in a liquid scintillation counter. Experimental results showed that a 0.3 mg dose of antibiotic/100 g and an 18 hr fasting of animals (after the cycloheximide was introduced) are the optimal conditions for the increase in the level of labeling of RNA. This increase reflects the intensification of the RNA synthesis and is considered as a compensatory regulation

eaction of the nuclear genetic apparatus to inhibi-
ion of the cytoplasmic protein synthesis in the rat
iver cells.

906 DISTRIBUTION OF NUCLEAR RNAS IN GROWING AND NONGROWING CELLS.

(E.) Birnie, G. D.
R. Beaston Mem. Hosp., Glasgow, Scotland), J. Del-
our, D. Angus, G. Threlfall and J. Paul. *Cold
pring Harbor Conf Cell Proliferation* 1:757-768,
974.

e nuclear RNAs in growing and nongrowing cells
ere compared in an effort to obtain information on
e role played by gene transcription in the control
 proliferation. A double-label gel electrophoresis
chnique was used to compare the RNA profile from
clei and cytoplasm of growing and nongrowing LS
ells (a substrain of mouse NCTC strain L929 which
ows in suspension). There was less mature ribo-
mal RNA relative to the amounts of ribosomal pre-
rsor RNAs and HnRNA (greater than 40S) in nuclei
 stationary phase cells than in nuclei of growing
lls. A reduction in the amounts of mature ribo-
mal RNAs in the nuclei of stationary phase cells
thout a corresponding reduction in the amounts of
bosomal precursor RNAs could be the result of a
crease in the rate of processing of the ribosomal
ecursors to 18S and 28S RNA, or of more rapid
ansport of the mature RNAs to the cytoplasm, or
th. The double-label technique was also used to
termine whether there were any differences in the
oportion of RNA molecules from growing and non-
owing cells which contained poly(A) regions.
out 20% of the nuclear RNA from growing cells
und to oligo(dT)-cellulose, whereas 36% of that
om stationary cells did so, indicating a signifi-
nt increase in the proportion of polyadenylated
 molecules in nuclei of stationary cells. In
-DNA hybridization experiments there was a sig-
icant difference in the proportion of the DNA
ridized to the RNA from growing and nongrowing
lls; the RNA from the nongrowing cells appeared
 have a considerably higher complexity than that
m the growing cells. No difference could be
nonstrated between the RNAs transcribed *in vitro*
m chromatins of growing and nongrowing cells.
 definite conclusions relating to differences in
nscriptional patterns can be drawn from these
eriments because the hybridization technique
d allows detection of repetitious sequences only.

7 SEQUENTIAL BIOCHEMICAL EVENTS IN PREPARATION FOR DNA REPLICATION AND MITOSIS.

) Tobey, R. A. (Cell. Mol. Radiobiol. Group, Los
mos Sci. Lab., Univ. Calif., New Mexico), L. R.
ley, C. E. Hildebrand, R. L. Ratliff and R. A.
ters. *Cold Spring Harbor Conf Cell Proliferation*
65-679, 1974.

 biochemical events required for the initiation
DNA synthesis were studied using Chinese hamster
ls (CHO line) reversibly arrested in G_1 by the
leucine deprivation technique. Cells released
m isoleucine-mediated G_1-arrest at the G_1/S
ndary were treated with hydroxyurea; when the
hydroxyurea was removed, the cells entered the S phase immediately and commenced dividing in a highly synchronized fashion within six hr. The kinetics of histone phosphorylation were studied in both nonproliferating cultures and in various stages of the cell cycle in proliferating cultures. The results, coupled with earlier data, indicate that the histone f3 and f1 subfractions were phosphorylated specifically as the cells crossed the G_2/M boundary, and were dephosphorylated as the cells moved out of mitosis into G_1. (^{14}C)thymidine labeling experiments in highly synchronized cultures further demonstrated an enhanced association of DNA complexed to membrane commencing approximately two hr prior to entry into the S phase and persisting at high levels through G_2. Finally, synchronized cultures were pulse-labeled with (^{3}H)thymidine to determine the kinetics of deoxyribonucleoside triphosphate acid-soluble pools as a function of proliferation stage and cell cycle position. Genome replication was prevented by inhibiting the increase in just one of the deoxyribonucleotides, dATP, with hydroxyurea. Within several min after the removal of the hydroxyurea, the level of dATP increased dramatically and the cells began synthesizing DNA. Although the levels of dGTP, dATP, and dTTP remained high through S, G_2, and into M, the level of dCTP began to drop as the cells completed the S phase and entered G_2. Thus, the pool level of dCTP only appeared to be roughly correlated with DNA synthesis. These studies indicate that once a decision is made to reenter the proliferation cycle, a sequence of preprogrammed operations is initiated long before actual DNA replication commences, and that once the cells are committed to a program of proliferation, the prevention of DNA replication does not necessarily prevent the initiation of the preparative events.

5908 ADRENOCORTICAL LIPID DEPLETION AND LEUKEMIA IN MICE.

(E.) Arnesen, K. (Ulleval Hosp., Univ. Oslo, Norway). *Acta Pathol Microbiol Scand* [*A*] (Suppl 248):15-19, 1974.

The relationship between adrenocortical lipid depletion in AKR mice and the high incidence of leukemia in this strain was investigated. In two series of experiments mice of the leukemic AKR/O strain were crossed with mice of the non-leukemic WLO strain to form two hybrid strains, CS and AC. In the F_2 generation 25% of the individuals carried the *ald* gene in double dose, thus revealing phenotypically the adrenocortical lipid depletion. The CS strain resulted from the mating of two *ald* homozygous F_2 animals and successive brother-sister matings; adrenocortical lipid depletion was still combined with high leukemia incidence. In the F_2 generation resulting from the original AKR/O x WLO cross, a male mouse with adrenocortical lipid depletion was back-crossed to WLO female. In the F_2 generation resulting from this mating a male with adrenocortical lipid depletion was back-crossed to a WLO female. This procedure was repeated many times and from the last F_2 generation a male and a female, both with adrenocortical lipid depletion were selected to give origin to a line of successive, vertical brother-sister matings, constituting the AC strain, in which the trait, adrenocortical lipid depletion, was preserved, whereas the leukemia incidence was reduced to zero level. In animals allowed to live out their full life span, the CS strain showed an incidence of leukemia of about 67%, whereas no case of leukemia occurred in the AC strain. Thy hybrid tests show that the adrenocortical lipid depletion can be completely dissociated from the inheritable proneness to develop leukemia. Thus the *ald* gene is unrelated to the gene(s) involved in the pathogenesis of mouse leukemia.

5909 ALKALINE RIBONUCLEASE ACTIVITY IN LYMPHOID ORGANS OF MICE AFTER INJECTION OF TUMOR CELLS. *(E.)* Maor, D. (Dep. Hum. Microbiol., Tel-Aviv Univ., Israel), E. Eylan and I. P. Witz. *Cancer* 34(6):1940-1942, 1974.

Inbred male C3H mice were inoculated i.m. with viable syngeneic sarcoma or normal muscle cells, and the changes in the alkaline ribonuclease activity (pH 8) within the host thymus, lymph nodes, and muscle measured. In animals inoculated with viable tumor cells, the thymus ribonuclease activity increased six-fold on day two and five-fold on day three following inoculation. The enzyme activity in the mesenteric lymph nodes was increased three-fold on days three and five. The activity of the muscle ribonucleases did not change, nor did the activity in the tissues of the mice injected with normal muscle cells. In the animals injected with the viable tumor cells, the thymus decreased in weight between days two and nine, returning to normal by day 15. The thymus weight did not change following inoculation with normal muscle cells. Palpable tumors developed in all tumor cell-inoculated mice within 15 days; no tumors developed in the muscle cell-inoculated animals. The relationship between the transitory changes in the tissue ribonuclease levels tumor-developing mice and the persistent elevations in serum ribonuclease in tumor-bearing patients is still not clear.

5910 THE BIOCHEMICAL SIMILARITY OF TUMOR AND EMBRYONIC CELLS. *(Rus.)* Khodosova, I. A. (Inst. Cytol., Leningrad, U.S.S.R.). *Tsitologiia* 16(6):667-674, 1974.

With a few exceptions, the activity of tissue-specific enzymes is generally decreased in tumor cells and is evidence of their undifferentiated state. The isoenzyme composition of a number of enzymes in both tumor and embryonic cells differs from that found in normal adult cells. These enzymes include lactate dehydrogenase, aldolase, pyruvate kinase, and hexokinase. These changes in isoenzyme composition have been observed in experimental animals shortly after administration of chemical carcinogens. The inducibility of some enzymes by hormones, e.g. tyrosine aminotransferase by glucagon, is lower in some minimal hepatomas and in the liver of embryonic and newborn mice than in the normal adult liver. Fetal and regenerating liver cells and hepatoma cells all have low levels of enzymes which detoxify exogenous substances. These findings suggest that carcinogenesis represents a blocking of ontogeny. (47 references)

5911 CONTROL OF ALKALINE PHOSPHATASE ACTIVITY IN CULTURED MAMMALIAN CELLS: INDUCTION BY 5-BROMODEOXYURIDINE, CYCLIC AMP, AND SODIUM BUTYRATE. *(E.)* Koyama, H. (Cancer Inst., Tokyo, Japan) and T. Ono. *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* 325-339, 1973.

The control of alkaline phosphatase activity in a somatic hybrid cell line, B-6, and induction by 5-bromodeoxyuridine (BrdU), cyclic AMP and sodium butyrate were investigated. Treatment of the cells with the thymidine analog, BrdU resulted in a marked induction of alkaline phosphatase activity. This induction was reversible, was antagonized by the addition of thymidine, and required continued synthesis of RNA and protein following incorporation of the analog into the DNA. The hybrid line can produce hyaluronic acid; this was inhibited by treatment with BrdU. It is proposed that induction is caused by an increase in the transcription rate of the genes for alkaline phosphatase, or by a decrease in the transcription rate of a presumed inactivating enzyme with rapid turnover, which might inactivate the phosphatase itself, or its mRNA. Also, alkaline phosphatase in the cells is more markedly induced by cyclic AMP and sodium butyrate. This induction required both new RNA and protein synthesis. BrdU inhibited several differentiated functions, while cyclic AMP induced them. Both chemicals induce alkaline phosphatase activity. The development of inducers and of mutants concerned with the expression of alkaline phosphatase activity may provide a unique and useful system for studying the control mechanism of gene expression and differentiation in mammalian cells.

5912 INCREASED RATE OF ACETYLCHOLINESTERASE SYNTHESIS IN DIFFERENTIATING NEUROBLASTOMA CELLS. *(E.)* Lanks, K. W. (Downstate Med. Cent., State Univ. New York, Brooklyn), J. M. Dorwin and B. Papirmeister. *J Cell Biol* 63:824-830, 1974.

A technique for measuring the rate of synthesis of acetylcholinesterase (AChE) was developed and used to determine this parameter in differentiating neuroblastoma cells. The rate of synthesis of (AChE) was measured in N18 neuroblastoma cells cultivated first in the presence of serum and then in serum-deficient medium. In the absence of serum, the specific activity of AChE began to rise rapidly after an initial lag period of 2-3 days, reaching a maximum level (10-20-fold increase) within seven days. The reappearance of AChE activity was delayed after inhibition of preexisting enzyme activity with soman, the duration of the lag period being directly proportional to the soman concentration initially used. Cycloheximide completely inhibited the recovery of AChE activity after soman inhibition, indicating that the reappearance of AChE activity after such inhibition is the result of *de novo* enzyme synthesis. Actinomycin D produced a slight initial inhibition followed by complete inhibition of recovery later on; when the rate of enzyme synthesis was corrected for the decrease in total protein synthesis in the presence of Actinomycin D, however, a rate of increase similar to that seen in the absence of antibiotic was obtained. Similarly, recovery of AChE activity after treatment with soman and exposure to cordycepin was similar to that observed for uninhibited differentiated cultures. Thus, the resynthesis of AChE after soman inhibition does not appear to require new mRNA. Cordycepin in conjunction with serum deprivation effectively inhibited the induction of AChE, indicating that the induction process itself does require the synthesis of new mRNA. Axonation, another index of differentiation, was not completely blocked by inhibition of RNA or protein synthesis; it presumably utilized only pools of pre-existing structural proteins.

5913 ENZYME INDUCTION IN PRIMARY CULTURES OF RAT LIVER PARENCHYMAL CELLS. *(E.)* Pariza, M. W. (McArdle Lab. Cancer Res., Univ. Wisconsin, Madison), J. E. Becker, J. D. Yager, Jr., R. J. Bonney and V. R. Potter. *Proc Fourth Int Symp Princess Takamatsu Cancer Res Fund, Tokyo* pp. 267-284, 1973.

The properties of rat hepatocytes isolated with the collagenase perfusion technique and cultured in monolayers for short periods of time (e.g. less than five days) were investigated in a series of experiments to suggest useful experimental protocols and to standardize the results of one experiment with those of another. Parenchymal liver cells were obtained from rats which were maintained under controlled conditions of feeding and lighting and killed at specified times. Over 30 x 10^6 single parenchymal rat liver cells could be obtained from one rat following collagenase perfusion. Replicate cultures were set up with about 1000 cells/mm^2. About 50% of the cells were attached and contiguous within 24 hr of culturing using Ham's F-12 medium supplemented with fetal calf serum, or using a modification of serum-free Waymouth's MB 752/1 in conjunction with collagen-coated plates. Metabolic data are reported based on induction studies on tyrosine aminotransferase and ornithine decarboxylase. The uptake of ^{3}H-TdR into DNA by cells isolated from trained rats given partial hepatectomies at a scheduled time under carefully controlled environmental conditions is also reported. The results of these investigations are compared with those of previously published experiments. It is suggested that the primary adult liver parenchymal cell monolayer culture method will eventually lend itself to the study of essentially every aspect of liver cell development and metabolic regulation.

5914 ALTERATIONS IN HORMONE RESPONSIVENESS OF HEPATIC ADENYLATE CYCLASE DURING ONTOGENESIS AND ONCOGENESIS. *(E.)* Christoffersen, T. (Inst. Pharmacol., Univ. Oslo, Norway) and I. Oye. *Acta Endocrinol* 77(suppl 191):67-72, 1974.

Alterations in the hormone responsiveness of rat liver adenylate cyclase during ontogenesis and oncogenesis are reviewed. At one week before birth, the fetal rat liver demonstrated a distinct cyclase activity which could be activated by fluoride but not by glucagon or adrenaline. Both hormones significantly stimulated the enzyme two days after birth, however. The basal activity of the cyclase and the activation produced by the hormones then increased until the end of the first postnatal week, after which the response to adrenaline declined and eventually disappeared while the response to glucagon remained relatively constant until adulthood. When adult rats were fed the carcinogen 2-acetylaminofluorene, the response to adrenaline reappeared, while the response to glucagon remained unchanged. Fully developed hepatomas showed high basal and fluoride stimulated enzyme activities, but the hormones produced only very small additional enzyme stimulation. *In vitro* studies of cyclic AMP accumulation in liver slices yielded similar results. The increased response to adrenaline observed in the livers of the carcinogen-fed rats resulted from changes in the parenchymal cell population, not from altered cellular composition of the liver tissue. The variation in hormone responsiveness during ontogenesis and oncogenesis may be due to changes in the number of receptor sites for the hormones, masking or demasking of receptor sites, or alterations in the mechanism which transduces the signal of activation from the specific receptors to the catalytic part of the cyclase.

5915 TESTOSTERONE AND OESTRADIOL IN DOGS WITH TESTICULAR TUMOURS. *(E.)* Comhaire, F. (Dep. Med., Univ. Clin., Ghent, Belgium), D. Mattheeuws and A. Vermeulen. *Acta Endocrinol* 77(2): 408-416, 1974.

Venous estradiol and testosterone concentrations were studied in three dogs with spontaneous Sertoli cell tumors and three dogs with seminomas of the testes. Mean peripheral estradiol concentrations in dogs with Sertoli cell tumor and seminomas (2.8 and 5.4 ng/100 ml, resp.) were higher than in controls (1.6 ng/100 ml). Mean plasma testosterone concentrations in tumor-bearing dogs were similar to that of controls. Spermatic vein estradiol concentrations were significantly higher (25.3 ng/100 ml) and testosterone concentrations lower (669 ng/100 ml) than those of controls (7.4 ng/100 ml and 367 ng/100 ml, resp.). Plasma hormone concentrations showed no correlation with either the presence or absence of feminization syndrome. It is concluded that seminomas, as well as Sertoli cell tumors, secrete increased amounts of estrogens, possibly due to an increase in the amount of tissue capsule able to convert testosterone to estrogen.

5916 ESTROGEN RECEPTOR IN NORMAL AND NEOPLASTIC MOUSE MAMMARY TISSUES. *(E.)* Richards, J. E. (Dep. Zool., Univ. California, Berkeley), G. Shyamala and S. Nandi. *Cancer Res* 34(10):2764-2772, 1974.

Soluble cytoplasmic fractions of lactating mammary glands, parenchyma-free mammary fat pads, spontaneous mammary tumors and transplanted mammary tumors from mice were assayed on sucrose density gradients for their specific estradiol-17β-^{3}H-binding capacities. The mouse strains and hybrids were: C^{-3}, C^{+}, I, C57BL, C57BL x I F_1, GR, RIII, and C3H. No correlation was found between the susceptibility of a strain to mammary tumor development and the ability of its normal mammary gland receptors to bind estradiol. The spontaneous mammary tumor showed binding capacities significantly lower than the normal gland, based on wet weight tissue and DNA content. There was no correlation between the binding capacity of a tumor and that of the normal glands of the same strain. Spontaneous mammary tumors appeared to maintain whatever receptor binding capacity they had when transplanted for one generation into normal or ovariectomized syngeneic hosts. The binding capacity of the C57BL x I F_1 hybrid had a value intermediate to the parental strain values, which were statistically significantly different from each other; this suggests that genetic factors may determine the level of estrogen receptor in normal mouse mammary glands. It is noted that measurement of a physiological characteristic, e.g., receptor levels, in a population of cells gives a value that may represent the average of a heterogeneous population. If cells giving use to or capable of growing within a tumor represent extremes of the heterogenous distribution, correlations of response and/or sensitivity with quantitative values may not resolve one cell population from another. Thus, the ultimate approach may be to analyze the receptors on an individual cell level.

5917 SOME ASPECTS OF NEUROBLASTOMA. *(E.)*

Kumar, S. (Clin. Res. Lab., Christie Hosp., Withington, England), J. K. Steward and M. A. Waghe. *Maandschr Kindergeneeskd* 42(9/10):428-435, 1974.

The relationship between the serum levels of nerve growth factor (NGF) and neuroblastoma was studied using 21 fresh neuroblastomas and serum samples from 28 patients and serum samples from 621 healthy donors. In addition, 11 neuroblastomas were established in tissue culture, and the effect of exogenous NGF or anti-NGF on the uptake of ^{3}H-thymidine by these cultures measured. The serum NGF level of the health donors was similar to that of the neuroblastoma patients, and none of eight neuroblastoma homogenates contained any detectable nerve growth promoting activity. The addition of NGF or anti-NGF to the tissue cultures similarly failed to influence the uptake of ^{3}H-thymidine by the neuroblasts, and the tissue culture medium contained no NGF. Injections of purified NGF into three children with wide-spread metastatic neuroblastoma also failed to alter the clinical course of the disease. It was also found that lymphocytes from neuroblastoma patients strongly inhibited autologous and allogeneic neuroblasts; this lymphocytotoxicity was specifically cancelled by factor(s) present in the sera of neuroblastoma patients who had actively growing tumors. The results indicate a lack of any significant abnormality of NGF metabolism in neuroblastoma patients. They also suggest that the absence of blocking factors in the sera of children with this disease may be associated with an apparent cure.

5918 RESULTS OF CYTOLOGICAL INVESTIGATIONS IN FEMALES UNDER 30 YEARS OF AGE. *(Hun.)*

Kocsis, Zs. (Munic. Counc. Hosp., Kazincbarcika, Hungary) and Z. Topscher. *Orv Hetil* 115(19):114-116, 1974.

Results of cytological examinations of the uterine cervix in 3,138 females under 30 years of age are presented. Successive colposcopic, conization, and abrasion tests revealed 23 cases of dysplasia, 11 cases of portio carcinoma *in situ*, and six cases of beginning microinvasion. The 17 carcinoma patients accounted for 13% of the total portio carcinoma material. The case histories of patients with portio carcinoma revealed that most patients were gravid, with many of them having been parous. Most of the patients were urban dwellers and had married at a young age. These data are in support of other epidemiological relationships between carcinoma of the uterine cervix and early sex life and possible promiscuity.

5919 ABNORMAL MICROSOMAL CYTOCHROMES AND ELECTRON TRANSPORT IN MORRIS HEPATOMAS.

(E.) Miyake, Y. (Sect. Biochem., Mol. Cell Biol., Cornell Univ., Ithaca, N.Y.), J. L. Gaylor and H. P. Morris. *J Biol Chem* 249(6):1980-1987, 1974.

Conditions necessary for accurate spectrophotometric assay of Morris hepatoma microsomal cytochromes P-450, P-420, and b_5 contained in tumor lines 7777, 5123C, and R3B cultured in Buffalo strain rats, were determined. The specific contents of cytochrome P-450 present in microsomes obtained from tumor lines 5123C, 7777, and R3B were: 0.31, 0.014, and 0.10 nM/mg of protein, resp.; the specific contents of cytochrome P-420 were: 0.038, 0.14, and 0.042 nM/mg, resp. Cytochrome b_5 was present in all samples of tumor microsomes; the specific content was higher in microsomes from tumors that contained greater amounts of cytochrome P-450. The amounts of flavoprotein of the NADH- and NADPH oxidative pathways of microsomes were lower than those of liver. The properties of flavoproteins of tumor were similar to hepatic microsomes.

5920 SUGAR-CONTAINING SUBSTANCES ON MICROSOMAL MEMBRANES ISOLATED FROM THE MOUSE LIVER AND L1210 MOUSE LEUKAEMIA CELLS. *(E.)*

Bartoszewicz, W. (Inst. Oncol., Warsaw, Poland) and W. Rossowski. *Folia Histochem Cytochem (Krakow)* 12(2):111-114, 1974.

Ultrastructural evidences that ruthenium red-staining substrances and concanavalin A-binding sugar residues can be demonstrated on the isolated rough and smooth surfaced microsomal membranes both from normal and malignant cells were determined in microsomal fractions isolated from DBA/2 mouse liver and L1210 mouse leukemia cells. On the outer surface of the rough microsomal vesicles the ruthenium red-staining material was distributed in the form of electron-dense patches. At a higher magnification, the ruthenium red-staining material was closely connected to the outer leaflet of the membrane only. On the smooth surfaced microsomal vesicles the ruthenium red reaction product usually appeared in the form of a thin layer. Conca-A-binding sugar residues were found both in the microsomal membrane fractions derived from the mouse liver and in those from L1210 mouse leukemia cells. The reaction product was located on only one of the two surfaces of the microsomal membrane. Generally, two types of vesicles were recognized in the smooth microsomal fractions. Most of the vesicles were densely stained with the conca-A /peroxidase/ diaminobenzidine complex on the outer surface. In some, the reaction product was localized on the inner surface of the smooth surface vesicles. The conca-A-binding reactions were essentially inhibited in the presence of 0.2 M α-methyl-D-mannoside. Such vesicles were more frequently found in the microsomal fractions derived from L1210 mouse leukemia cells. The results support the opinion that ruthenium red does not penetrate the plasma membrane of intact cells during fixation but it does gain entrance to damaged cells. The same seems to be true for the microsomal membranes.

5921 EFFECTS OF VITAMIN E ON ^{3}H-2-DEOXY-D-GLUCOSE (2DOG) TRANSPORT IN NORMAL AND TRANSFORMED CELLS. *(E.)* Humphrey, L. P. (Boston Univ. Med. Sch., Mass.) and L. M. Corwin. *Fed Proc* 33(3):671, 1974.

5922 THE EFFECTS OF INTRAVENOUS NUTRITION ON TUMOR GROWTH. *(E.)* Oram-Smith, J. C. (Univ. Pennsylvania, Philadelphia), E. Steiger, E. Miller, M. Wallack and H. M. Vars. *Fed Proc* 33(3): 670, 1974.

5923 DECREASED INTESTINAL DISACCHARIDASE AND PEROXIDASE ACTIVITY IN HYPERALIMENTED RATS. *(E.)* Castro, G. A. (Univ. Texas Med. Sch., Houston), E. Copeland, S. Dudrick and L. R. Johnson. *Fed Proc* 33(3):692, 1974.

5924 HYBRIDIZATION PROPERTIES OF DNA AND MOUSE MYELOMA mRNA. *(E.)* Legler, M. K. (Univ. Chicago, Ill.) and E. P. Cohen. *Fed Proc* 33(3):725, 1974.

5925 REGRESSION OF TUMORS WHICH DEVELOPED FROM ME-^{14}C METHACRYLATE TREATED TRANSPLANTS. *(E.)* Palmer, W. N., Jr. (Lousiana State Univ. Med. Cent., New Orleans) and P. M. Hyde. *Fed Proc* 33(3): 781, 1974.

5926 THE OCCURRENCE OF VITAMIN A IN MUCINOUS ADENOCARCINOMAS OF RAT SMALL INTESTINE. *(E.)* Sundaresan, P. R. (St. Joseph Hosp., Lancaster, Pa.), J. M. Ward and L. M. DeLuca. *Fed Proc* 33(3): 670, 1974.

5927 EFFECT OF HIGH AND LOW RISK DIETS FOR COLON CANCER ON FECAL BILE ACIDS AND NEUTRAL STEROLS IN MAN. *(E.)* Reddy, B. S. (Am. Health Found., New York, N.Y.), A. K. Dhar, D. Vukusich, J. H. Weisburger and E. L. Wynder. *Fed Proc* 33(3):663, 1974.

5928 METHYLATED MINOR BASES OF LOW MOLECULAR WEIGHT RNAs DERIVED FROM LYMPHOCYTIC CELLS ISOLATED FROM PATIENTS WITH LEUKEMIA OR INFECTIOUS MONONUCLEOSIS. *(E.)* Wulff, U. C. (Child. Cancer Res. Found., Boston, Mass.), L. S. Desai, R. Heuer, . Meissner and G. E. Foley. *Fed Proc* 33(3):636, 974.

5929 SURVIVAL AND REPLICATION OF HEMANGIOENDOTHELIOMA CELLS IN CULTURE. *(E.)* Lewis, L. J. (Univ. Iowa Coll. Med., Iowa City), J. C. Hoak and G. L. Fry. *Fed Proc* 33(3):596, 1974.

5930 DECREASED ENERGY SUPPLY IN PLATELETS IN ACUTE MYELOGENOUS LEUKEMIA (AML). *(E.)* Patel, I. (Mt. Sinai Sch. Med. City Univ. New York, N.Y.), L. M. Aledort and E. G. Puszkin. *Fed Proc* 33(3):336, 1974.

5931 ENZYME HISTOCHEMISTRY OF SJL/J MOUSE LYMPHOMA. *(E.)* Katayama, I. (Univ. Hosp., Boston, Mass.), K. Balogh, C. Y. Li and L. T. Yam. *Fed Proc* 33(3):597, 1974.

5932 DETECTION OF BIOLOGICAL ACTIVITY OF GROWTH HORMONE IN PLASMA OF RATS BEARING MtW15 TUMORS. *(E.)* Reagan, C. R. (Dep. Physiol., Emory Univ., Atlanta, Ga.), J. S. Harper and J. L. Kostyo. *Fed Proc* 33(3):277, 1974.

5933 MEMBRANE PROTEIN TURNOVER IN HeLa CELLS DURING THE CELL CYCLE. *(E.)* Proctor, W. R. (Univ. Tennessee-Oak Ridge Grad. Sch. Biomed. Sci.) and J. S. Cook. *Fed Proc* 33(3):251, 1974.

5934 TRANSPLANTATION OF CANINE LYMPHOCYTIC LEUKAEMIA. *(E.)* Owen, L. N. (Dep. Anim. Pathol., Univ. Cambridge, England). *Bibl Haematol* (39):139-148, 1973.

5935 REGAN ISOENZYME IN PATIENTS WITH HEMATOPOIETIC TUMORS. *(E.)* Belliveau, R. E. (U.S. Public Health Service Hosp., Baltimore, Md.), L. A. Yamamoto, A. R. Wassell and P. H. Wiernik. *Am J Clin Path* 62(3):329-334, 1974.

5936 KARYOTYPE AND ULTRASTRUCTURE OF A MALIGNANT HUMAN MELANOMA. *(Ger.)* Svejda, J. (Med. Fac., Brno, Czechoslovakia), M. Vrba and O. Hornak. *Arch Geschwulstforsch* 43(2):186-192, 1974.

5937 INFORMING EXPERIMENTS WITH A REPRODUCIBLE SUBSTRATE OF HUMAN COLON CANCER CULTIVATED IN SYRIAN HAMSTER (GW-77-STRAIN) BY THE MODIFIED ABDERHALDEN' REACTION (SPECIFIC TUMOR-PROTEINASE-REACTION). *(Ger.)* Tetzner, E. (Reg. Hosp., Soltau/ Hannover, West Germany). *Arch Geschwulstforsch* 43(2):182-185, 1974.

5938 TISSUE CULTIVATION OF INFECTED GYNECOLOGICAL TUMORS AFTER STERILIZATION WITH PERACETIC ACID. *(Ger.)* Krafft, W. (Med. Akad. Erfurt, East Germany), M. Sprossig, H. Mucke, F. Marzotko and W. Preibsch. *Arch Geschulstforsch* 43(2):177-181, 1974.

5939 ATROPHIC GASTRITIS AND GASTRIC CARCINOMA: SOME GENETICAL ASPECTS. *(E.)* Ihamaki, T. (Meilahti Hosp., Helsinki, Finland), K. Varis, M. Isokoski, M. Kekki, P. Sipponen and M. Siurala. *Scand J Gastroenterol* 9(27):45, 1974.

5940 EXPRESSION OF THYMIDINE KINASE VARIANTS IS A FUNCTION OF THE REPLICATIVE STATE OF CELLS. *(E.)* Adler, R. (Roche Inst. Mol. Biol., Nutley, N.J.) and B. R. McAuslan. *Cell* 2(2):113-117, 1974.

5941 ELECTRICAL IMPEDANCE OF MALIGNANT AND NORMAL RAT THYMUS CELLS. *(E.)* Giberman, E. (Israel Inst. Biol. Res., Ness Ziona), S. Gothilf and A. Keysary. *J Natl Cancer Inst* 53(3):893-894, 1974.

5942 THE CELLULAR MANIFESTATIONS OF EXTRAUTERINE CANCER. *(E.)* Ng, A. B. P. (Inst. Pathol., Case Western Reserve Univ., Cleveland, Ohio), D. Teeple, E. A. Lindner and J. W. Reagan. *Acta Cytol (Baltimore)* 18(2):108-117, 1974.

5943 GLYCOGEN SYNTHESIS IN MOUSE EHRLICH ASCITES CARCINOMA CELLS. THE PRESENCE OF AN ENDOGENOUS INHIBITOR FOR ACTIVATION OF GLYCOGEN SYNTHASE. *(E.)* Baba, T. (Res. Inst. Tuberc., Lepr. Cancer, Tohoku Univ., Sendai, Japan) and S. Tsuiki. *Biochim Biophys Acta* 370(2):419-430, 1974.

5944 TYROSINASE ACTIVITY AND ISOZYMES IN B-16 MOUSE MELANOMAS. *(E.)* Chen, Y. M. (Dep. Biol. Wayne State Univ., Detroit, Mich.) and D. V. Singh. *Oncology* 30(5):386-392, 1974.

5945 CELL KINETIC STUDIES IN PATIENTS WITH LUNG CANCER. *(E.)* Muggia, F. M. (Albert Einstein Coll. Med., Bronx, N.Y.). *Oncology* 30(5):353-361, 1974.

5946 PARALLEL ENZYMATIC CHANGES DETECTABLE IN CANCER AND SCHIZOPHRENIC PATIENTS AS A POSSIBLE RESULT OF ENVIRONMENTAL STIMULATION. *(E.)* Galzigna, L. (Dep. Med. Biochem., Univ. Nairobi, Kenya), M. Bossi and A. Burlina. *Agressologie* 15(3):197-202, 1974.

5947 A MORPHOMETRIC STUDY OF SOME ENDOCRINE ORGANS IN ASCITES TUMOUR-BEARING MICE. *(E.)* Srebro, Z. (Med. Acad., Krakow, Poland), E. Pierschinska and E. Szirmai. *Agressologie* 15(4):247-252, 1974.

5948 CHILDHOOD LYMPHOBLASTIC LYMPHOMA: A MALIGNANCY OF THYMUS DERIVED LYMPHOCYTES. *(E.)* Kaplan, J. (Child Res. Cent. Michigan, Detroit), R. Mastrangelo and W. Peterson, Jr. *Z Kinderheilkd* 117(4):303-304, 1974.

5949 INFLUENCE OF HORMONAL STATUS ON ARGINASE ACTIVITY IN MAMMARY TISSUE & TUMOUR. *(E.)* Bhide, S. V. (Cancer Res. Inst., Bombay, India). *Indian J Exp Biol* 12(5):379-381, 1974.

5950 ULTRASTRUCTURAL LESIONS IN THE RESPIRATORY EPITHELIUM OF MAN AND ANIMAL MODELS OF BRONCHOGENIC CARCINOMA. *(E.)* Harris, C. C. (Natl. Cancer Inst., Bethesda, Md.), D. G. Kaufman, M. Sporn and U. Saffiotti. *Am J Pathol* 74(2):98a, 1974.

5951 DEFECTIVE MONONUCLEAR PHAGOCYTE FUNCTION IN PATIENTS WITH MYELOMONOCYTIC LEUKEMIA AND IN SOME PATIENTS WITH LYMPHOMA. *(E.)* Cline, M. J. (Univ. California Sch. Med., San Francisco). *J Clin Invest* 52(9):2185-2190, 1973.

5952 INFECTIOUS MONONUCLEOSIS: ITS RELATIONSHIP TO AND CONFUSION WITH MALIGNANT LYMPHOPROLIFERATIVE DISEASES. *(E.)* Alpert, L. I. (Methodist Hosp., Brooklyn, N.Y.). *Diagnostica* (28):15-18, 1973.

5953 CANCER-WOODWORKING STUDY MAY BE BROADENED. *(E.)* Anonymous. *Eng News Rec* 193(19):19, 1974.

5954 HUMAN BREAST CARCINOMA *IN VITRO*, HORMONALLY-DEPENDENT PROLIFERATION IN SHORT-TERM ORGAN CULTURE. *(E.)* Lagios, M. D. (Children's Hosp. San Francisco, Calif.). *Am J Clin Pathol* 62(2):308, 1974.

5955 CARCINOEMBRYONIC ANTIGEN IN PATIENTS WITH NEUROBLASTOMA. *(E.)* Wang, J. J. (Roswell Park Mem. Inst., N.Y.), L. F. Sinks and T. M. Chu. *J Surg Oncol* 6(3):211-217, 1974.

5956 CAPACITY FOR TUMOR CELL IMPLANTATION AS A FUNCTION OF *IN VITRO* CELL DENSITY. *(E.)* Bosmann, H. B. (Univ. Rochester Sch. Med. Dent., N.Y.) and A. Lione. *Biochem Biophys Res Commun* 61(2):564-567, 1974.

5957 ENERGY COUPLING AND EXTRAMITOCHONDRIAL ELECTRON TRANSPORT IN SLICES OF MORRIS HEPATOMA 3924A. *(E.)* Galeotti, T. (Inst. Gen. Pathol., Catholic Univ., Rome, Italy), E. D'Amico, E. Marchese, R. Bompiani, T. Terranova and M. Russo. *Z Krebsforsch* 81(1):37-50, 1974.

5958 ULTRASTRUCTURE OF HODGKIN'S CELL. PRELIMINARY REPORT. *(E.)* Mikata, A. (Keio Univ. Sch. Med., Japan), T. Oishi and K. Kageyama. *GANN Monogr Cancer Res* 15:287-289, 1973.

5959 SCANNING ELECTRON MICROSCOPY (SEM) OF CARCINOMA *IN SITU* AND METAPLASTIC CELLS. *(E.)* Murphy, J. F. (Dept. Obstet., Gynecol., U. Birmingham, England), J. A. Jordan, J. M. Allen and A. E. Williams. *Cancer Cytol* 13(1), 1973.

5960 THE ASSOCIATION OF DYSPLASIA AND CARCINOMA *IN SITU* OF THE UTERINE CERVIX. *(E.)* Mikuta, J. J. (Univ. Pennsylvania Hosp., Philadelphia). *Cancer Cytol* 13(1), 1973.

5961 PULSED NUCLEAR MAGNETIC RESONANCE STUDIES IN NORMAL AND MALIGNANT CELLS. *(E.)* Ranade, S. S. (Tata Mem. Ctr., Bombay, India), R. S. Chaughule, S. R. Kasturi and R. Vijayaraghavan. *Cancer Cytol* 13(1), 1973.

5962 GASTROINTESTINAL PROTEIN LOSS WITH BENIGN AND MALIGNANT TUMORS OF THE LARGE BOWEL. *(E.)* Seydel, H. G. (Fox Chase Ctr. Cancer, Med. Sci., Philadelphia, Pa.) and J. G. Strawitz. *Cancer Cytol* 13(1), 1973.

5963 CYTOPHOTOMETRIC AND CYTOLOGIC STUDIES IN BENIGN AND MALIGNANT PERICARDIAL EFFUSIONS. *(E.)* Stecher, G. (Med. Inst., Nucl. Res. Facility, Julich, Germany) and P. Pfitzer. *Cancer Cytol* 13(1), 1973.

5964 EXAMINATION OF EXFOLIATED CERVICAL CELLS BY THE SCANNING ELECTRON MICROSCOPE (SEM). *(E.)* Murphy, J. F. (Dept. Obstet., Gynecol., Microbiol., U. Birmingham, England), J. M. Allen, J. A. Jordan and A. E. Williams. *Br J Cancer* 28(1):86, 1973.

5965 GENETIC MARKERS FOR LEUKAEMIA. *(E.)* O'Donovan, D. K. (Dept. Med., Therap., U. Coll., Dublin, Ireland) and J. Bell. *Br J Cancer* 28(1):87, 1973.

5966 FOLLOW-UPS IN SYSTEMIC BLOOD DISEASES (LEUKEMIA, WALDENSTROM'S DISEASE) AND IMMUNE DEFICIENCIES BY USING TYPICAL MARKERS FOR B- AND T-CELLS. *(Ger.)* Beyer, J. H. (Essen Clin., West Germany), C. Hertenstein, M. Lipke, C. G. Schmidt and O. Wetter. *Verh Dtsch Ges Inn Med* 80:1502-1505, 1974.

5967 THE ESTABLISHMENT OF HUMAN BREAST CARCINOMA CELL LINES FROM PLEURAL EXUDATES. *(E.)* Cailleau, R. (M.D. Anderson Hosp., Tumor Inst., Houston, Tex.), R. K. Young, M. Olive and W. J. Reeves, Jr. *Tex Rep Biol Med* 32(2):602, 1974.

5968 SYNTHESIS AND METHYLATION OF DNA IN SYNCHRONIZED NEOPLASTIC CELLS. *(It.)* Geraci, D. (International Inst. Genetics Biophys., Naples, Italy), T. Eremenko, R. Cocchiara, A. Granieri, E. Scarano and P. Volpe. *Boll Soc Ital Biol Sper* 49(18 bis):no. 290, 1973.

5969 SIMULTANEOUS OCCURRENCE OF SARCOMAS IN A HUSBAND AND WIFE. *(E.)* Goldenberg, G. J. (Dept. Med. Pathol., Univ. Manitoba, Winnipeg), G. M. Spurll and G. R. Hogg. *Can Med Assoc J* 110(1):49-52, 1974.

5970 URINARY "CARCINOEMBRYONIC-LIKE" ANTIGEN IN THE DIAGNOSIS OF CARCINOMA OF THE BLADDER. *(E.)* Guinan, P. (Cook County Hosp., Chicago, Ill.), I. M. Bush, N. Sadoughi, T. John and R. J. Ablin. *Clin Res* 22(1):43a, 1974.

5971 CORRELATIONS BETWEEN SARCOMA-DISTINCTIVE IMMUNE REACTIONS MEASURED *IN VITRO* AND CLINICAL COURSE OF PATIENTS. *(E.)* Campos, L. T. (Univ. Texas M.D. Anderson Hosp., Houston), J. G. Sinkovics, J. R. Cabiness, F. Gonzalez and H. D. Kay. *Clin Res* 22(1):43a, 1974.

5972 VARIATIONS IN TISSUE CULTURE BEHAVIOR OF TWO UNRELATED MURINE NEUROBLASTOMAS. *(E.)* Ruffner, B. W., Jr. (Univ. Virginia Sch. Med., Charlottesville) and M. F. Smith. *Clin Res* 22(1):44a, 1974.

5973 THE USE OF TECHNETIUM-99m AS A RADIOISOTOPIC LABEL TO STUDY THE MIGRATORY PATTERNS OF NORMAL AND NEOPLASTIC CELLS. *(E.)* Barth, R. F. (Univ. Kansas Med. Cent., Kansas City), O. Singla and G. Y. Gillespie. *Am J Pathol* 74(2):43a, 1974.

5974 INTRATHYROIDAL C CELL DISTRIBUTION IN OCCULT FAMILIAL MEDULLARY CARCINOMA. *(E.)* Wolfe, H. J. (New England Med. Ctr. Hosp., Boston, Mass.), R. A. DeLellis, J. M. Gibson and A. H. Tashjian, Jr. *Am J Pathol* 74(2):46a, 1974.

5975 GW-532: A NEOPLASTIC CELL LINE IN HAMSTERS GRAFTED WITH A HUMAN LYMPHOID TUMOR. *(E.)* Goldenberg, D. M. (Univ. Kentucky Med. Cent., Lexington) and R. A. Pavia. *Am J Pathol* 74(2):46a, 1974.

5976 TURNOVER OF IODINATED PLASMA MEMBRANE PROTEINS OF HEPATOMA TISSUE CULTURE CELLS. *(E.)* Tweto, J. H. (Roswell Park Mem. Inst., Buffalo, N.Y.) and D. J. Doyle. *Fed Proc [II]* 33(5):1415, 1974.

5977 BIOLOGIC BEHAVIOUR OF CANINE MAMMARY NEOPLASMS BASED ON A HISTOGENETIC CLASSIFICATION. *(E.)* Fowler, E. H. (Univ. Rochester Sch. Med., N.Y.), G. P. Wilson, III and A. Koestner. *Am J Pathol* 74(2):45a, 1974.

5978 IMMUNOLOGIC, ELECTRON MICROSCOPIC AND HISTOCHEMICAL STUDIES OF LYMPH NODE CELLS FROM NON-HODGKIN'S MALIGNANT LYMPHOMAS. *(E.)* Leech, J. H. (Vanderbilt Univ. Sch. Med., Nashville, Tenn.), A. D. Glick, R. G. Horn and R. D. Collins. *Am J Pathol* 74(2):47a-48a, 1974.

5979 ACUTE LEUKEMIA: A DISEASE OF MEDICAL PROGRESS? CASE REPORTS. *(E.)* Kardinal, C. G. (Ellis Fischel State Cancer Hosp., Columbia, Mo.), A. Barnes and R. P. Pugh. *Mo Med* 71(12):683-684;689, 1974.

5980 BIOCHEMICAL CRITERIA FOR THE *IN VITRO* DIFFERENTIATION OF EMBRYOID BODIES PRODUCED BY A TRANSPLANTABLE TERATOMA OF MICE. THE PRODUCTION OF ACETYLCHOLINE ESTERASE AND CREATINE PHOSPHOKINASE BY TERATOMA CELLS. *(E.)* Levine, A. J. (Dep. Biochem. Sci., Princeton Univ., N.J.), M. Torosian, A. J. Sarokhan and A. K. Teresky. *J Cell Physiol* 84(2): 311-317, 1974.

5981 BEHAVIOR OF ALKALINE LEUKOCYTE PHOSPHATASE IN LYMPHORETICULAR NEOPLASIA. *(Ger.)* Krug, K. (II. Med. Clin. Polyclin., Martin-Luther-Univ., Halle-Wittenberg, East Germany), L. Stenzel and G. Schingnitz. *Folia Haematol (Leipz)* 101(5):745-754, 1974.

5982 THE CARCINOMA OF THE LARYNX: A PATIENT'S STUDY OF THE OTORHINOLARINGOLOGY CLINIC AT THE DISTRICT HOSPITAL "HEINRICH BRAUN," ZWICKAU, FROM 1955-1973. *(Ger.)* Zipfel, L. (Otorhinolaryng. Clin., Heinrich Braun District Hosp., Zwickau, Germany). *Laryngol Rhinol Otol (Stuttg)* 53(12):909-923, 1974.

5983 PREVALENCE OF SYMPTOMLESS MALIGNANT GASTRIC TUMOURS. *(Dan.)* Fogh, B. (Sdr. Fasanvej 60, 2500 Valby, Denmark). *Ugeskr Laeger* 136(44): 2455-2458, 1974.

5984 THE CORRELATION BETWEEN THE INCIDENCE OF GIANT CELLS IN L CELL CULTURES AND THE NUMBER OF INOCULATED CELLS. *(Rus.)* Shuklinov, V. A. (Inst. Oncol. Problems, Ukr. Acad. Sci., Kiev, USSR). *Tsitologiia* 16(12):1517-1518, 1974.

5985 THE STUDY OF DNA-DEPENDENT RNA-POLYMERASE IN THE LYMPHOCYTE NUCLEI OF HEALTHY PEOPLE AND PATIENTS WITH CHRONIC LYMPHATIC LEUKEMIA. *(Rus.)* Blinov, M. N. (Inst. Hematol. Blood Transfus., Leningrad, USSR), A. D. Vladimirova and I. S. Luganova. *Tsitologiia* 16(11):1388-1391, 1974.

5986 CONGENITAL TUMORS. *(Ger.)* Sitka, U. (Child. Hosp., Martin-Luther Univ., Wittenberg, E. Germany), W. Fritz and H. Calker. *Paediatr Grenzgeb* 12(6):377-396, 1973.

5987 THE EFFECT OF BACTERIAL RNA ON PROTEIN SYNTHESIS AND TRANSPLANTABILITY OF EHRLICH ASCITES CARCINOMA. *(Rus.)* Zerov, Iu. P. (Dept. Biochem., Leningrad Univ., USSR), V. V. Roschin and I. P. Ashmarin. *Tsitologiia* 16(3):352-357, 1974.

5988 COMPARATIVE MORPHOMETRIC STUDIES OF ULTRASTRUCTURAL REARRANGEMENTS IN NORMAL AND MALIGNANT THYROID CELLS DURING DIFFERENT PERIODS OF EMBRYONAL DEVELOPMENT. *(Rus.)* Dmitrieva, N. P. (Inst. Biol. Development, Moscow, USSR), S. B. Stefanov and E. M. Shvirst. *Tsitologiia* 16(3):551-554, 1974.

5989 DELAYED DIAGNOSIS AND THERAPY OF BREAST TUMORS. *(Ger.)* Petersen, H. (Surg. Hosp., Univ. Dusseldorf, W. Germany) and W. Meyer. *Med Klin* 69(46):1889-1894, 1974.

5990 THE EFFECT OF CERTAIN BASIC DYES, INCLUDING THOSE WHICH INCORPORATE INTO DNA, ON ADENOSINETRIPHOSPHATASE ACTIVITY OF MITOCHONDRIA. *(Rus.)* Beliaeva, T. N. (Inst. Cytol., Leningrad, USSR), M. D. Fadeieva and A. D. Braun. *Tsitologiia* 16(6):741-746, 1974.

5991 THE FORMATION OF LAMELLAR CYTOPLASM AND INTERCELLULAR CONTACTS BY NORMAL AND TUMOR FIBROBLASTS IN DENSE CULTURE. *(Rus.)* Olshevskaia, L. V. (Inst. Exp. Clin. Oncol., Moscow, USSR) and A. P. Cherny. *Tsitologiia* 16(5):545-550, 1974.

5992 FAMILIAL MULTIPLE COLONIC POLYPOSIS. *(Fl.)* Carlier, A. (Univ. Hosp., Ghent, Belgium) and F. Barbier. *Tijdschr Gastroenterol* 17(2):103-109, 1974.

5993 THE DISTRIBUTION OF LACTATE DEHYDROGENASE ISOENZYMES IN BREAST CANCER TISSUES AT DIFFERENT STAGES OF MATURITY. *(Ger.)* Ziegenbein, R. (Cent. Inst. Oncol. Res., Berlin-Buch, E. Germany), and C.-N. Schremmer. *Z Exp Chir* 7(4):228-234, 1974.

5994 A CASE OF CONCURRENT ACUTE MYELOCYTIC AND CHRONIC LYMPHOCYTIC LEUKEMIA. *(Dt.)* van Hove, W. (Univ. Hosp., Ghent, Belgium), H. de Baere and J. Hamers. *Ned Tijdschr Geneeskd* 118(45):1702-1705, 1974.

5995 MORPHOMETRIC STUDIES OF THE DEGREE OF MALIGNANCY IN CERTAIN CONNECTIVE TISSUE TUMORS. *(Rus.)* Iagubov, A. S. (P. A. Gertsen Res. Oncol. Inst., Moscow, USSR) and V. A. Kats. *Arkh Patol* 36(11):55-60, 1974.

5996 HISTOCHEMICAL STUDIES OF ACID PHOSPHATASE IN TUMOR CELLS OF GASTRIC CARCINOMA. *(Rus.)* Dikshtein, E. A. (Donetsk Med. Inst., USSR) and I. V. Vasilenko. *Arkh Patol* 36(11):67-72, 1974.

5997 STUDIES OF ALPHA-FETOPROTEIN IN PREGNANT WOMEN AND NEWBORNS. *(Sp.)* Cohen, J. (Salaberry Hosp.), A. L. Cohen, H. E. Forgione and Z. Gutfraind. *Acta Gastroenterol Latinoam* 6(1): 7-10, 1974.

5998 CLEAR-CELL ACANTHOMA. CLINICAL, HISTOLOGICAL AND ULTRASTRUCTURAL OBSERVATIONS. *(Ger.)* Ebner, H. (Univ. Hosp. Skin Diseases, Vienna, Austria) and E. Erlach. *Dermatologica* 149(3):155-162, 1974.

5999 FOCAL EPITHELIAL HYPERPLASIA OF THE ORAL MUCOSA: HECK'S DISEASE. *(Ger.)* Orfanos, C. E. (Univ. Hosp. Skin Diseases, Koln, W. Germany), V. Strunk and H. Gartmann. *Dermatologica* 149(3): 163-175, 1974.

6000 A CASE OF MALIGNANT TRANSFORMATION OF SPITZ *NAEVUS CELLULARIS.* *(Pol.)* Sniegocki, J. (Oncol. Hosp., Bydgoszcz, Poland). *Wiad Lek* 27(15): 1413-1414, 1974.

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